8

The Circular Rather than the Linear Economy

To become more sustainable, companies need to go from traditional, linear business models based on "take, make and dispose" to circular business models based on reuse, resource efficiency, the sharing economy and closed loops. This can counteract resource depletion, reduce pollution and be a source of cost reductions, new revenue streams and better risk management for companies.

Fig. 8.1 The Circular Rather than the Linear Economy

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8.1 The Future Goes in Circles

Imagine a world without garbage, wherein what we used to refer to as waste is the most important resource. Some would argue that we are already on our way there. Did you know that most of the materials in a HÅG chair are reusable? Already, in 1991, HÅG used recycled plastic from bottle caps and ketchup bottles in its office chairs. Today, the company also uses other types of plastic in its products (Fig. 8.1).

In 2015, the European Association of Plastics Recycling and Recovery Organisations named the HÅG Capisco chair "Best Recycled Product 2015". HÅG Capisco is made from 100 percent recycled plastic, and 90 percent of its aluminum parts are also recycled. These office chairs contain no environmentally harmful substances, and none of the parts are glued together. Moreover, the chair is composed of very few materials, so that it is easy to disassemble and recycle at the end of life, and it is thus easy to use the materials in new products.

HÅG is not alone in making these types of changes to its products and business models. During the past decade, a new, circular-economic reality has gradually emerged. This development implies companies gradually changing their business models from being linear to become circular (see, e.g., McDonough and Braungart 2010; Stahel 2016; Bocken et al. 2016). Global giants like Apple, Google and Phillips are redesigning their business models to become more circular. This includes building the so-called closed-loop supply chains, in which as few resources as possible disappear in the form of waste or emissions.

These companies are joining the movement from a linear economy that drains the planet of resources and generates large quantities of waste to a circular economy that ensures that resources are used repeatedly, thus preventing large amounts of resources going astray and becoming waste (e.g., Webster 2015). Circular-economic thinking is based on the idea of the economy being restorative and regenerative—that is, economic activities should strengthen rather than break down social and environmental resources (McDonough and Braungart 2010). This entails maintaining products and materials in the economy at as high a quality as possible

over time so that they can be reused many times. This phenomenon is referred to as *upcycling*, rather than recycling, which emphasizes the attempt to retain high value of materials, components and products, rather than allowing them to deteriorate downwards in the value hierarchy (McDonough and Braungart 2013).

This transition can have large effects on economy, society and the environment alike. A study of seven European countries concluded that a transition to a circular economy has the potential of reducing each nation's greenhouse gas emissions by 70 percent and increasing employment by 4 percent (Ellen MacArthur Foundation 2015). Both the consultancy firm McKinsey and the think tank the Club of Rome have estimated that there is an enormous profit potential for companies that develop circular business models. However, it will require very significant changes and breaking with one of the most fundamental characteristics of the production of products and services: it requires moving from a linear to a circular economy.

From Linear to Circular Value Chains

The essence of circular-economic thinking is that we need to abandon the linear value chain, which is based on the logic of "take, make and dispose", and rather build circular value chains, in which materials are used repeatedly (Stahel 2016). On the one hand, this concerns resources in the biological cycle, such as water, biomass, gas and other natural resources. On the other hand, it concerns resources in the technical cycle, such as plastic, glass and other materials that do not occur naturally (e.g., Lacy and Rutqvist 2015). Companies can think circular and reuse resources in both cycles, and thus prevent resources that previously went to waste—whether water, energy or physical resources—from disappearing out of the circle.

Linear thinking has dominated since the beginning of the third industrial revolution, and it has led to growth and prosperity in many parts of the world. It is, however, also one of the reasons for our current sustainability problems because the linear model implies using resources in an unsustainable way and producing large quantities of waste that destructs

Fig. 8.2 A traditional linear value chain

the environment further. Much of this waste is even toxic and harmful in other ways, so that it is not possible to reuse it (Fig. 8.2).

The circular-economic paradigm suggests that there are at least three necessary responses to the problem. First, we need to use resources in a way and to an extent that does not exhaust resource stocks. Many resources are exploited at such a rate that they will ultimately be completely depleted. This includes many metals, minerals and fossil fuels, not to mention various fish stocks. A circular-economic model requires balancing the use of these resources, while facilitating the regeneration of such renewable resources (see, e.g., McDonough and Braungart 2010).

Second, companies must design products, services and processes in ways that lead to less use of scarce resources and facilitate the reuse thereof. Specifically, this means designing away externalities, for example, by creating products that are possible to disassemble and reuse at the end of life (see, e.g., Bocken et al. 2016).

Third, all products and materials must be maintained at as high a quality level as possible, so that they can actually be reused. Circulation economists argue that we must "upcycle" resources (McDonough and Braungart 2013). Traditional recycling is really "downcycling", which means that resources are gradually degraded until eventually becoming unusable. When a plastic bottle is recycled into a fleece sweater, the plastic resource is still on its way to the landfill. If the sweater is burned when it is worn out, it generates energy, but it can happen only once.

Upcycling, on the other hand, implies maintaining the value of the resource so that it can be used repeatedly. Could one, for example, make a plastic bottle that is possible to use many more times? Alternatively, could one make a bottle in which the plastic does not deteriorate in

quality when it is recycled? Increasingly, car manufacturers design their cars in such a way that components from old cars can be reused in new cars with little refurbishing. Even the new ships in the Danish company Maersk are designed in this way so that the ships can be easily disassembled several decades from now, which solves the problem of illegal shipbreaking on the beaches of poor countries, which results in pollution and health risks for poor shipbreakers. In addition, it importantly enables the recovery of ship parts of high value. Finally, it allows for simple replacement of parts that can give the ship a longer product life.

Such changes involve a shift from the traditional thinking of "from cradle to grave" toward a mindset of designing products and services "from cradle to cradle" (McDonough and Braungart 2010). In total, these circular-economic ideas thus involve redesigning products, services and value chains in a manner that allows for the use and reuse of products and resources in smarter ways (Jørgensen and Pedersen 2018). This implies a new model for producing, consuming and, finally, recycling products and services, and so the cycle begins again.

In order to attain the benefits of a circular economy, it is vital that companies design profitable, circular business models. The design of such business models can be done on at least five different levels (Fig. 8.3). As we see from the circles in the figure, companies can rent out their products, which, for example, MUD Jeans and Filippa K do with clothes. They can also offer repair services; they can reuse either parts of or all of the products and resell them; they can refurbish and renew products and they can upcycle resources and materials and thus reuse them instead of extracting new, virgin resources.

The Two Fundamental Cycles

HÅG's business model is designed to create, deliver and capture value by taking advantage of business opportunities in the circular economy. The chairs are made from recycled materials, they are designed in a way that makes them durable and easily repairable, and when they are worn out, they can easily be disassembled and their parts reused in new chairs. An important characteristic of the chair design is precisely that it is easy to

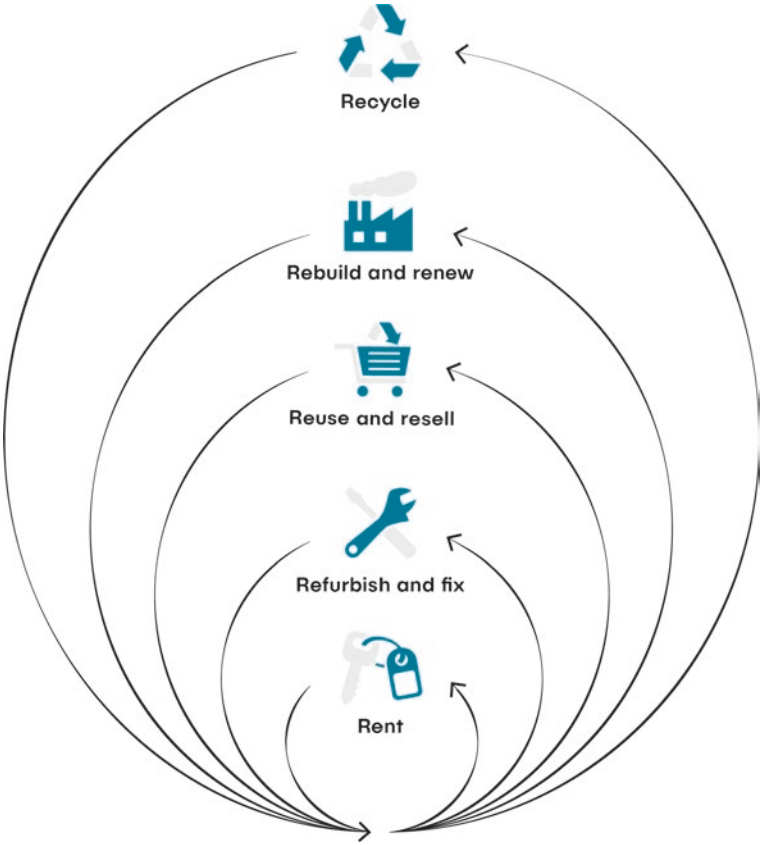

Fig. 8.3 Different types of upcycling in circular business models

disentangle the materials produced by naturally occurring resources and those that are processed from materials that do not occur naturally. These two types of resources must be treated differently and be possible to separate after the product's life span. Michael Braungart and William McDonough (2010) argue that resources should be seen as belonging to two fundamental cycles that reflect this distinction—the biological and technical cycles, respectively. These two cycles are illustrated below. It should be noted that any product will usually be made up of resources from both cycles (cf. Bocken et al. 2016).

The biological cycle comprises biological nutrients that regenerate continuously in natural cycles, such as cotton, plants, fungi and animals. In this cycle, waste, such as dead animals and plants, become food for bacteria and fungi, and thereby degrade into fertile soil through natural processes (i.e., composting). The technical cycle comprises materials such as plastics, glass and other resources that are not naturally generated in the biological cycle. Resources from this cycle therefore become waste that does not decompose naturally, and instead become waste if we do not create systems to reuse them (e.g., Webster 2015).

The vast majority of products consist of materials from both the biological and technical cycles. For example, the HÅG Capisco chair is made from metal and plastic parts from the technical cycle as well as wool from the biological cycle. When HÅG makes a point of the various parts of the chair not being glued together, it is precisely because it makes it easier to disassemble the chair after use. In this way, the cotton can be returned to the biological cycle, while the metals can be attributed to the technical cycle and, for instance, melted for repurposing. Some metal and plastic parts from HÅG chairs can be used directly in new chairs, thus being channeled right back into the technical cycle without requiring melting or similar repurposing. Other parts of the chair, like the cotton on the seats, are simply biodegradable. They are designed to be directly returned to nature, thus providing nourishment to the soil when they decompose (Fig. 8.4).

It is costly to recover and refine resources from both the biological and technical cycles. It requires water, transport and labor to produce cotton and aluminum, and it is a waste of scarce resources to compost cotton or melt aluminum if they instead can be reused in their existing form. For materials to be reused, they cannot be contaminated, they need to be produced in such a way that ensures durability, they must be easily reusable and it must be easy to disentangle, for instance, plastic, cotton and aluminum. A transition to a circular economy will therefore require large investments in new product design, new manufacturing processes and new activities, such as collection of old products and processing for reuse. Although the benefits of such a transition can be very large in the longer term, large transition costs should be expected in the shorter term.

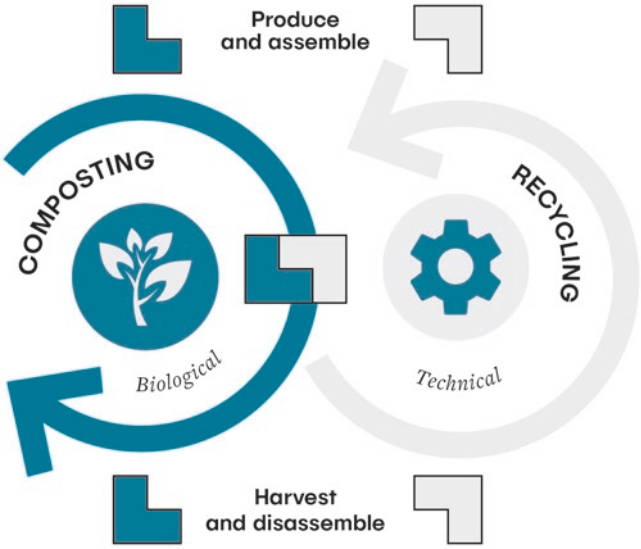

Fig. 8.4 The two basic cycles (based on McDonough and Braungart 2013)

8.2 Resources Astray

It is expected that by the year 2050, we will reach the point where there is more plastic than fish in the ocean, measured in weight (Ellen MacArthur Foundation 2017). The amount of plastic that floats in the ocean and assembles in increasingly massive garbage patches is very destructive to marine ecosystems.

The problem does not only exist at sea—there is also a huge plastic waste problem on land. However, more and more companies are finding ways to turn the plastic problem into an opportunity, and currently plastics from the oceans are used to make everything from carpets to shoes. This is also the concept of the Spanish clothing brand Ecoalf, which produces a full range of fashion apparel and bags made from old fishing nets and plastic bottles.

Using 235 grams of fishnets, Ecoalf makes one meter of yarn, which in turn is used to produce winter jackets and other products. Ecoalf is not capable on its own to conduct the entire process leading up to this.

Therefore, the company has established 18 joint ventures with other companies in order to collect waste, develop yarn and design and distribute its products. Ecoalf and its partners have thus developed a business model that enables the collection of waste and the production of new materials, and thereby novel and innovative ways of designing, producing, distributing and selling fashion clothes.

By using circular-economic thinking, Ecoalf and its allies turned the plastic problem into an opportunity. There are numerous business opportunities in the circular economy, and innovative companies can create value by recovering resources that have gone astray and putting them back into productive use.

Values at Stake

The circular model is characterized by being restorative and regenerative. It implies designing production processes and products in ways that strengthen rather than break down ecosystems and natural resources. This may be done by biodegradable products that nourish the environment rather than polluting it, and it may be done through the reuse of resources that in turn renders the exploitation of scarce virgin resources unnecessary (McDonough and Braungart 2010).

Upcycling of resources requires that materials, whether they come from the biological or technical cycle, maintain as high a value as possible for the longest possible time. Finished products typically have the highest value, while their parts and raw materials have a lower value. Finished products can for instance be used repeatedly, which requires business models that facilitate the repair, rental, sharing or reselling of products (Bocken et al. 2016; Jørgensen and Pedersen 2017). When this is not possible, companies can harvest the resources and reuse them or recycle them. An example is Norsirk, the Norwegian company that is responsible for the recycling of electrical and electronic waste. It has managed to attain a reuse of 97.5 percent of all components in stoves, for instance, thus keeping virtually all product components at a high level by enabling reuse.

Contaminated materials have the lowest value. Examples include materials that include asbestos, which can be included in neither the biological nor the technical cycle. A jacket from Ecoalf or an office chair from HÅG thus has a higher value than the constituent parts that go into making them. In order to maintain as high a value as possible, the products should be designed to last long. This may imply that companies offer repair services or sell the products on the secondary market. When the HÅG chair is worn out, its parts have a higher value than do materials for recycling. This implies maintaining the chairs at a higher level of value by designing for direct reuse of the parts.

The same applies to the biological cycle, in which the cotton fibers in chairs or in clothes have been planted, watered, harvested, transported and processed. This process is both energy- and resource-intensive, and we should therefore try to maintain the high value of the cotton once it is produced. Until it is worn out, it should be reused rather than buried in landfills. This of course depends on the cotton not being contaminated by toxins, in either production or use. And if the cotton is glued together with materials from the technical cycle, such as plastic, it will not decompose naturally. Regardless, we should wait as long as possible to lead the cotton back into the biological cycle. Used cotton should preferably be reused repeatedly as inputs in other products, such as insulation in car seats, for which many car manufacturers are using old, used socks. Only when the cotton is completely worn out should it be returned to nature.

As pointed out by Bocken et al. (2016), circular business models build on at least three strategies. First, closing the loop, that is, ensuring a flow of resources from post-use to production of new products. Second, narrowing the loop, that is, ensuring resource efficiency and the use of fewer resources per produced unit. Third, slowing the loop, that is, ensuring longer product lives by designing for longevity. Each of these three strategies on their own, but not at least in combination, can be the basis for significantly more circular business models.

Along the circular, closed-loop value chain, there are numerous business opportunities that innovative businesses can exploit (see, e.g., Lieder and Rashid 2016). Big companies are making their own systems in which they design long-lasting products and make money on additional services such as repair, upgrades and refurbishing. Some of these

companies are now starting to rent rather than sell products, which implies that they regain access to the products after customers are done with them (see, e.g., Lacy and Rutqvist 2015). In that way, they can rent them out again or harvest their parts and thus get access to valuable resources. Big companies such as Apple, Renault and H&M, for instance, operate in this way.

Not all companies are big enough to conduct all activities that are necessary to succeed with a circular, closed-loop value chain. This opens for a variety of business models that can offer services along the value chain to help other organizations become more circular (cf. Bocken et al. 2016). For example, there are design agencies with expertise on circular product design, waste management companies that sell recycled materials as inputs into new products, technology companies that offer digital platforms for sharing and other types of consumption, companies that can facilitate the sale of used products on the secondary market and R&D organizations that can provide knowledge on how to recycle materials optimally to avoid excess energy and resource use. In other words, there are numerous business opportunities in facilitating the circular economy, for small and large companies alike. Many of the companies we use as examples in this book have done just this: Newlight Technologies recycles CO_2 to produce biodegradable plastic that Dell and other big companies use in their products. Interface redesigned its entire business model in a manner that included reusing waste as inputs in their carpets. Similarly, Norsk Gjenvinning provides services related to waste management and the smarter use of resources along the entire circular value chain.

It should be noted that not all sustainability challenges are necessarily best solved by means of circular solutions. Circular business models are particularly well suited to solve challenges related to product life cycles and resource scarcity more broadly. There are of course many other types of sustainability challenges that can be solved by means of other approaches that are not explicitly circular. However, generally speaking, the solutions offered by circular thinking imply increased cycling of materials, components and products, which is beneficial from a sustainability standpoint and which can reduce the footprint of products and services in many different industries. The three approaches outlined above—closing, slowing and narrowing the loop—together form a set of

design strategies that can lead to considerably more sustainable business models.

Inspired by Nature

A prominent part of the circular economy is the idea that business should be in harmony with, and even reinforce, nature's own processes. A related development that is the basis for many exciting technologies and business models is products and production processes that imitate or copy mechanisms and elements from nature. This phenomenon is called biomimicry (see, e.g., Harman 2013). An example is the British company Skipping Rocks Lab, which has developed an alternative to plastic bottles. The company found inspiration in nature, after studying how plants collect liquid by means of membranes. This led to the design of Ooho!—a liquid packaging that is made from seagrass and other naturally occurring input factors. It looks like a small, spherical bottle, and it is not only an affordable alternative to traditional bottles, but it is also supremely biodegradable: It is actually edible!

The materials of which the bottle is made are reminiscent of an orange peel. When made thicker, the material can also be used to transport and store large quantities of other liquids. Such technologies thus have significant potential to be put to use for solving very different kinds of problems over time.

A comparable example is the US design and technology company Ecovative, which employs fungi to create a biological alternative to polystyrene. The world is flooded with polystyrene, which has significant adverse effects on the environment. The young founders of the company started experimenting with various forms of fungi and grew fungi in molds that made it possible to create packaging that is strikingly similar to polystyrene but biodegradable instead of environmentally harmful. After many years of experimenting with the technology, Ecovative has managed to make the product competitive on price, and it has companies like IKEA, Dell and Stanhope on its list of clients. The company also extended its product line with other products that use mushrooms as inputs such as insulation and floating docks.

These examples all illustrate some of the potential in biomimicry. There has been an explosion in business models built on such ideas, and we have probably only seen the beginning of this technology's utilization. It can be used to design and produce goods in ways that are less harmful and restorative rather than destructive to nature and ecosystems that are fully in line with the principles of the circular economy.

Unemployment Also Reflects Resources Astray

When speaking of the circular economy, it is easy to think of the environmental characteristics of business models. However, the ideas can also be used advantageously on human resources and the social dimension of business models. Ecoalf collects plastic waste, such as fishing nets, and uses it as an input factor in their products. In this way, the company also creates jobs for poor people in areas with a large surplus of plastic waste. Many so-called social entrepreneurs aim to solve social problems by creating jobs through which people are given the opportunity to help themselves (see, e.g., Peredo and McLean 2006; Short et al. 2009).

The Plastic Bank is built around such an idea. This company won Sustainia's Community Award in 2015 for its pioneering work with collecting plastic waste. David Katz and Shaun Frankson formed the company in 2013. They set out to contribute to alleviating two major problems: plastic pollution and poverty. They do this through a model that turns plastic into a currency, which enables poor and unemployed people to earn money by collecting plastic. The company provides incentives to poor people to collect plastic waste in Haiti and elsewhere. It pays collectors in cash or by vouchers that can be used to buy food and other essential products, or to charge their mobile phones or access similar services.

The Plastic Bank thus helps transform waste—it upcycles plastic from waste into new resources. In addition, The Plastic Bank creates valuable jobs for poor people who would otherwise not have been able to support themselves and their families. The CEO, David Katz, enthusiastically told us of his visions for the company when he visited our master course at NHH Norwegian School of Economics, and we

had to take him on a long walk in the mountains of Bergen, Norway, to channel his exuberant energy. And David's enthusiasm is indeed contagious: On Facebook, people engage in campaigns to encourage companies into using plastic from The Plastic Bank. Lush Cosmetics has financed part of The Plastic Bank's activities in Haiti, and use plastic in the containers of Lush products. More recently, big companies such as Henkel and institutions such as the UN have partnered with the company The successful pursuit of many more large customers will be decisive for the business model of The Plastic Bank to be viable over time.

Social entrepreneurship involves using business tools to help solve societal and community-related problems. A defining feature of social entrepreneurship business models is that they primarily help solve a social or environmental problem, but that they use principles and tools from the business world (cf. Short et al. 2009). In this way, they align the desirable purposes of aid organizations and other non-profit organizations and the well-founded economic and organizational approaches that characterize modern companies. This can happen internally in established companies, as in the Norwegian outerwear company Stormberg, in which 25 percent of the workforce are people who are struggling to get into the labor market, for example, due to a history of drug problems and crime (Jørgensen and Pedersen 2015).

However, social entrepreneurship often takes place in smaller companies, in which the social dimension is at the core of the business model. This is, for instance, the case for Tyrili Climbing, for which Sveinung serves as the chair of the board. Tyrili is a facility that treats drugs addicts, but in Lillehammer, Norway, the organization also runs a climbing center—a commercial enterprise that sells climbing courses and climbing gear. Many people who use the climbing center are not aware that drug addicts in recovery largely run the center. The addicts learn how to run a company, they organize competitions and they serve as instructors for climbing students from the Norwegian College of Elite Sports. In this way, the organization creates value both for its own clients—the drug addicts—and for the many satisfied users of the center.

In Norway, the investment company Ferd and its owner Johan H. Andresen have actively promoted this type of social entrepreneurship. One of the companies in Ferd's portfolio is Monsterbedriften (Monsters Inc)—a social entrepreneur that conducts demolition services for the construction industry. In this company, most employees have a background from drug abuse and crime. Many social entrepreneurs are dedicated to bringing idle human resources back into productive activity, whether this includes former criminals, drug addicts or simply people who for various reasons have difficulty entering the labor market. In this way, social entrepreneurship also comprises a kind of circular thinking, in which excess and idle resources that have not been able to contribute to productive activity are brought back into the value chain (cf. Dentchev et al. 2016). This creates value both for the people who get to work and for the companies to which they offer their labor.

During a trip through Brazil in 2017, we encountered a unique social entrepreneurship business model that is based on a dual circular logic—it attempts to upcycle both human and natural resources. We were on foot through a colorful part of Rio de Janeiro called Lapa, when Refettorio Gastromotiva suddenly revealed itself to us. Originating from Milan, Italy, this social entrepreneur tries to solve two problems at the same time. At the core of its business model is the growing problem of poverty and hunger in Rio, tied to the substantial youth unemployment. The people behind Gastromotiva connected this to the problem of food waste in the more affluent parts of the city—from stores, restaurants and so on. Gastromotiva uses such discarded food close to its expiry date to cook three-course dinners for the poor in Lapa. "Why should they eat at a soup kitchen just because they are poor?", asked Mariana Vilhena Bittencourt, one of the managers at Gastromotiva. "And why shouldn't they eat at a beautiful location?" Gastromotiva's interior is indeed beautiful, and there are few complaints about the food—as one of Rio's leading chefs leads the kitchen every evening. Part of Gastromotiva's unique value proposition is that it has a rotation of top chefs cooking pro bono at the restaurant. Not only that, however—the chefs also contribute to Gastromotiva's in-house cooking school—another part of the value proposition, which is aimed at helping poor youth in Rio get jobs in the kitchens of hotels and restaurants in the city.

In this way, Gastromotiva contributes human and natural resources for societal benefit that would otherwise have gone astray. We were so inspired by our visit to this social entrepreneur that we set up an internship program for our business school students in Norway—allowing them to get hands-on experience contributing to build a sustainable business model for Gastromotiva. Currently, the company is funded by a set of global giants, including Coca-Cola and Carrefour. However, as Mariana pointed out to us on the busy day we visited the company: "We want to be self-sufficient. We want to build a sustainable business model that can survive and that we can scale." The company's quest to attain this is still ongoing, and their attempt to build a circular business model for this venture encapsules the challenge that many social entrepreneurs face.

The Circle is Not Closed

Ecoalf is just one of many companies that embrace the new, circular reality, and which has developed an ecosystem of partners that together offer products, services and jobs. Both research and anecdotal knowledge suggest that companies increasingly collaborate on green innovation projects, both with suppliers, NGOs, industrial networks, authorities and competitors. In this way, they try to find more sustainable solutions. One reason for this is that sustainability issues are complex and global in nature, and most companies realize that they cannot solve these problems on their own. Collaboration does not only happen among businesses—also consumers see that collaborative efforts can solve problems and lead to smarter consumption. Although we are slowly circling toward a more sustainable economy, much still remains before we have completely circular business models in place.

Not at least, many companies that aim to build circular and service-based business models using digital and knowledge-intensive technologies require a high degree of collaboration with stakeholders who can help with this expertise. The importance of such alliances to promote sustainable business is the topic of the next chapter.

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