Circular Economy Business Models and Practices

Anna Itkin

Abstract Business model is at the heart of every business. It is the way a company creates, captures, and delivers value and it is a prerequisite for a strategy to be implemented throughout an organization. Traditionally, value was considered to be purely financial. However, with increasing global environmental, social, and political challenges, we need to create a more sustainable society where economic growth is decoupled from resource consumption. In order to enable the transition to circular economy, businesses are expected to play a significant role in the shift to a circular economy by implementing circular business models.

Keywords Business model · Circular business model · Value · Innovation · Design · Sustainability · Resource loops

Learning Objectives

- What is a business model?
- What is value?
- Business models as a value creation mechanism
- Circular Economy Business Models as an archetype of Sustainable Business Models

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1 Introduction

1.1 Introduction to a Business Model

Business, since it first began in pre-historic times, was about selling at profit. The business model (BM) concept became prevalent with the dawn of the Internet in the mid-1990s (Fig. 1). And in 2010 Alexander Osterwalder and Yves Pigneur had offered a comprehensive definition of a BM as "…the rationale of how an organization creates, delivers, and captures value" (Fig. 2). This definition is built on a broad underlying theory that represents company's interactions with its value chain and broader network of stakeholders, fulfillment of its existing business strategy, and can be used as a tool for innovation and communication.

Osterwalder and Pigneur have designed Business Model Canvas (BMC) (Fig. 3), that lays out and connects assumptions about key resources and activities of the value chain, value proposition, creation, delivery and capture, customer relationships, key channels, customer segments, cost structures, and revenue streams [1]. The proposed nine building blocks will have a specific configuration for each company that describe and define how it creates, captures, and delivers value. BM is not a static structure, rather it's a continuous work in progress, given a company wants to stay relevant

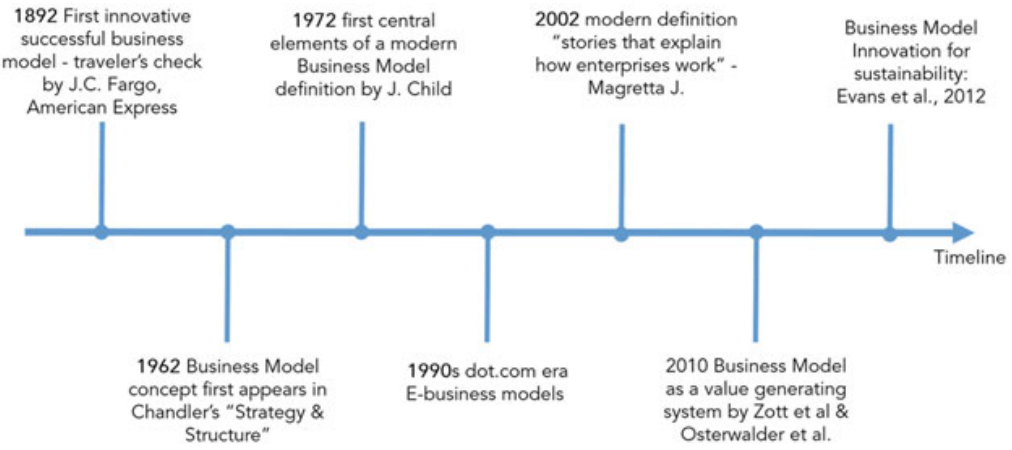


Fig. 1 Major Milestones in Business Model Development

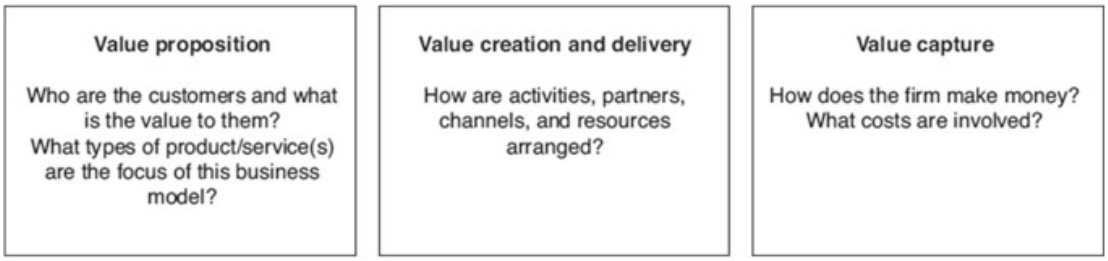


Fig. 2 Core pillars of the business model. Whalen, K [12], Ph.D. thesis

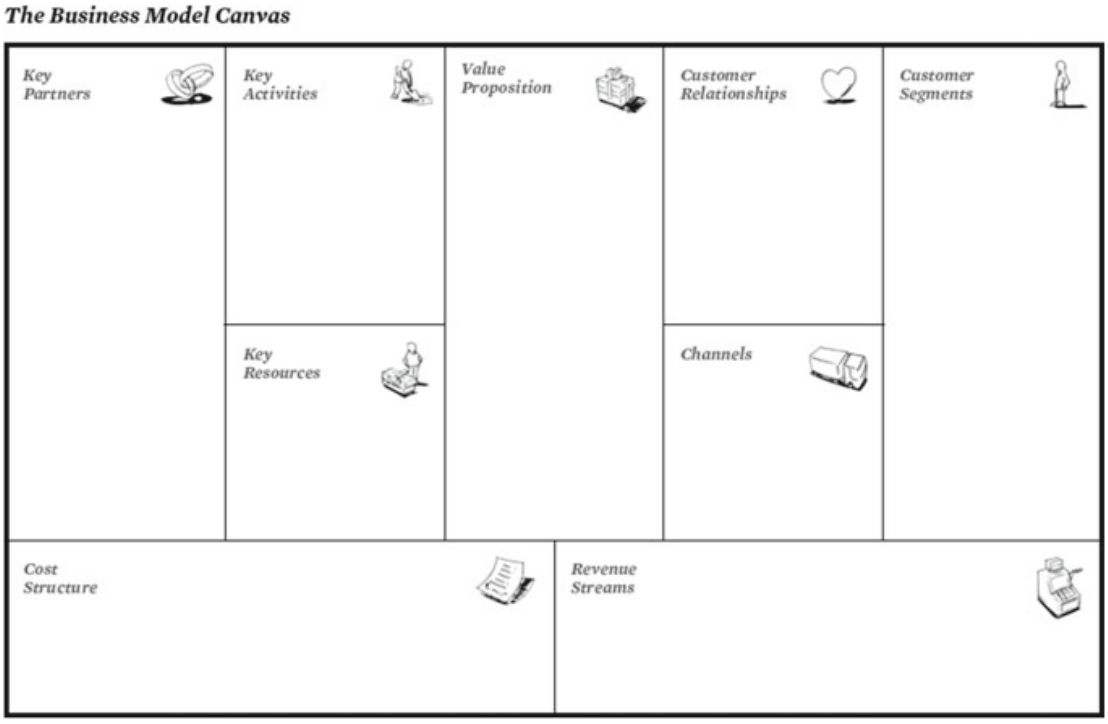


Fig. 3 Business Model Canvas (BMC) tool developed by Osterwalder and Pigneur [1] (strategyzer.com) build on the BMC, Ellen McArthur foundation in collaboration with IDEO have added prompts and questions to facilitate design of a circular business model [24]

and profitable in the long-term. Similar to the scientific method–it starts with a hypothesis, which is then tested and revised with changing business environment. In increasingly *volatile, uncertain, complex,* and ambiguous (VUCA) world, companies can use this approach to become resilient and to remain relevant. Consideration of a wide range of stakeholder interests – including environment and society among them – in the BM, serves as an important driver of business innovation that can help to embed sustainability into a business purpose, processes and strategy, and serve as a key to creation of competitive advantage. How can we encourage companies to significantly change the way they operate to ensure more responsible production and consumption? Business Model Innovation (BMI) is an approach that helps to deliver sustainability [2] and circularity through BM reconfiguration and broader value creation.

1.2 Value Creation Through a Business Model

From a value creation perspective, BMs traditionally focused on satisfying the customer needs, economic return to shareholders, compliance, regulation or legislation requirements, long-term economic viability or continuity of the firm. Sustainable business models (SBM), however, widen the notion of value creation to include environmental and social value. Environmental value creation covers sustainable use of

natural resources, biodiversity conservation, avoidance of waste and pollution or their safe recycling and elimination, regeneration of ecological services such as natural climate regulating systems, pollination, and soil fertility. Social value creation is concerned with issues such as all stakeholder inclusion and participation in decision-making, responsibility, labor standards, human rights, community relations, welfare, culture, poverty alleviation, and equal opportunity to access resources [2]. In order to shift from traditional BM to SBM, companies undertake BMI activities (Fig. 4) that enable them to generate competitive advantage whilst also creating environmental and social value and contributing to sustainable development.

A definition of SBM by Schaltegger et al. states that "A business model for sustainability helps describing, analyzing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries" [3].

One subset of SBM are Circular Business Models (CBM) – these are BMs and industrial processes which embed extended use of products, their parts, and materials by means of designing out waste and pollution. Beyond immediate environmental benefits at its core, the circular economy is about economics and competitiveness, says Professor Walter Stahel. In 1970s, he pioneered work on extending the life cycle of products and later coined the term **Performance Economy** (or Functional Service Economy), which focuses on selling performance/services instead of goods in a circular economy, internalizing all costs (using closed loops, cradle to cradle approach) [4]. In 1981, Stahel articulated these ideas in his paper "The Product-Life Factor" and identified selling service instead of products as the ultimate SBM of a circular economy: selling service enables to create sustainable profits without an externalization of the costs of risk and costs of waste [5]. From the business perspective, longer product-life strategies and the impact of circular industrial design deliver competitive advantages to companies when compared to simply recycling. Taking plastic as an example, McKinsey & Company calculated that plastics reuse and recycling could generate profit-pool growth of $60 billion for the petrochemicals and plastics sector [6]. The "The New Plastics Economy: "Rethinking the future of plastics" report by World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company calculated that plastic packaging material value loss translates into an annual value loss of $80–120 billion [7].

1.3 Expanded Schools of Thought

A small number of thought leaders and scholars devised additional schools of thought around what circular economy is about (Fig. 5). Professor John T. Lyle proposed the idea of **regenerative design** where all systems, from agriculture onwards, could be conceived and executed in a regenerative manner-that processes themselves renew or regenerate the sources of energy and materials that they consume [25].

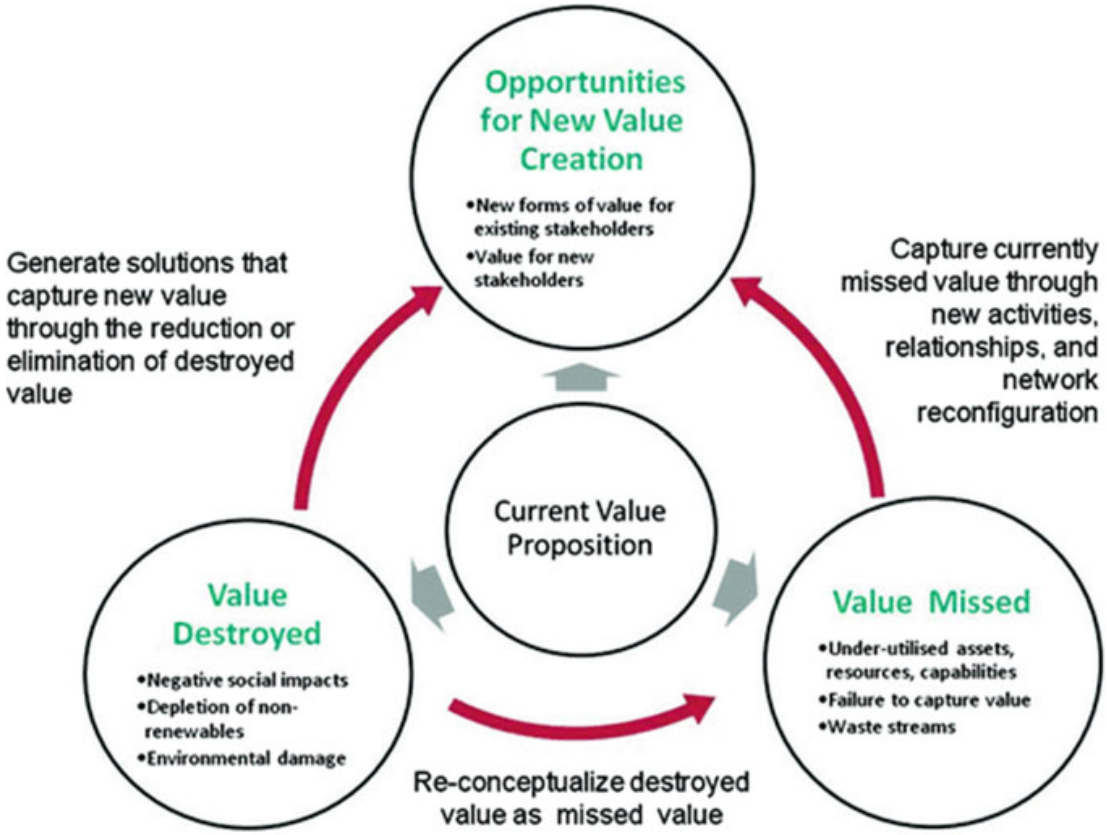


Fig. 4 A value mapping tool for sustainable business modelling [26]

Michael Braungart and Bill McDonough have developed the **Cradle to Cradle**™ concept [27] and certification process [28]. The Cradle to Cradle framework focuses on design for effectiveness in terms of products with positive impact, which fundamentally differentiates it from the traditional design focused on reducing negative impacts.

Industrial ecology is a man-made ecosystem that operates in a similar way to natural ecosystems, where the waste or by product of one process is used as an input into another process, thus closing the loop on the notion of waste with an emphasis on natural capital restoration. Industrial ecology adopts a systemic point of view, designing production processes in accordance with local ecological constraints while looking at their global impact such that they perform as close to living systems as possible. Principles of industrial ecology can also be applied in the services sector with a focus on social wellbeing [8].

Janine Benyus defines her approach—**Biomimicry—**as "a new discipline that studies nature's best ideas and then imitates these designs and processes to solve human problems". Biomimicry relies on three key principles where nature serves as model to emulate forms, processes, systems, and strategies to solve challenges; as an ecological standard to judge sustainability of all innovations; and as a mentor to learn from rather than a reservoir of resources to exploit [9].

Natural capitalism was described by Paul Hawken, Amory Lovins, and L. Hunter Lovins in their book "Natural Capitalism: Creating the Next Industrial Revolution" as

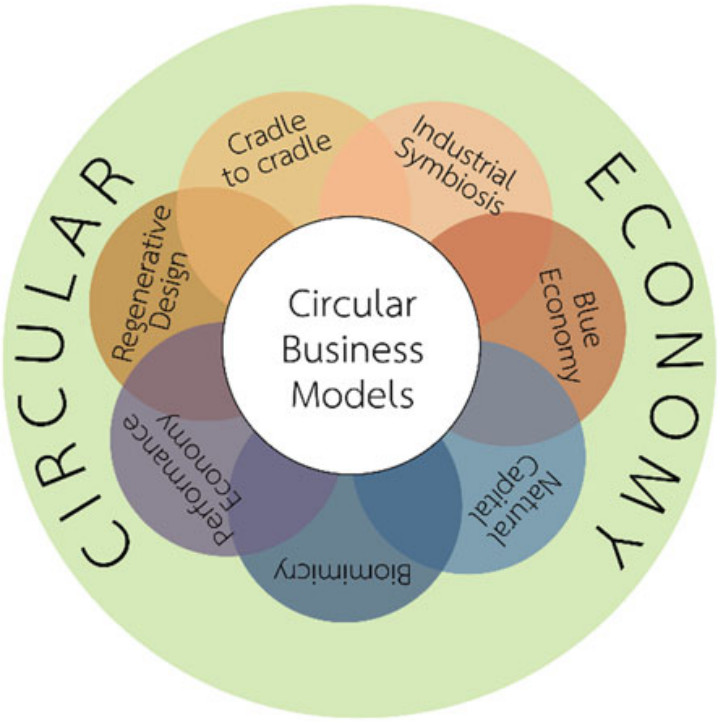


Fig. 5 Extended Schools of Thought (the image by Sawaros)

a global economy in which business and environmental interests overlap, recognizing the interdependencies that exist between the production and use of human-made capital and flows of natural capital [10]. The idea of natural capitalism relies on four principles:

1. Radical change in design, production, and technology that prolongs the use of natural resources resulting in savings in cost and time, and therefore, increased productivity.
2. Eliminate the concept of waste, inspired by nature where all systems are circular—an output of one process becomes and input of another.
3. Product as service business model where value is created through continuous flow of services rather than product sales.
4. Restore and regenerate natural capital—the world's stocks of natural assets including soil, air, water, and all living things.

Blue Economy initiated by former Ecover CEO and Belgian businessman Gunter Pauli. The idea of Blue Economy is based on 21 founding principles using locally available resources and sufficiency. It is driven by innovative business models that provide competitive advantage through innate virtues and values connecting untapped local potential [11].

1.4 Overview of Circular Business Models

Existing CBMs are difficult to assess because of the diverse value constellations and various extent of contributions towards achieving Circular Economy. It was found

that firms contribute to a circular economy through two main overarching circular business model strategies: "Extending Product Value" and "Extending Resource Value" [12] (Table 1).

The sole theoretical classification of CBMs currently available in academic literature can be seen in Fig. 6 [13]. Building on this concept, Whalen [12], classified the archetypes according to their value proposition, creation & delivery, and capture (Table 2). The classical definition states that CBMs capture, create, and deliver value by *slowing*, *closing*, and *narrowing resource loops* [12]. *Slowing resource*

Table 1 .

	Extending Product Value	Extending Resource Value
Focus of value propositions	offer products or components (durable or previously obsolete)	offer recovered resources or production by-products
		offer products made from recovered resources
	offer services related to products and their recovery	offer services related to resource recovery
		offer energy from recovered resources
Approaches to value creation & delivery	provide long life products or offer warranty guarantees	use recovered resources in new production
	perform product maintenance	facilitate resource recovery
	enable product recontextualization	
	undertake repair/ refurbishment/ remanufacturing	undertake resource recovery
Sources of value capture	revenue from resale of previously obsolete products and resources (e.g., new revenue streams)	
	cost savings	
	service contracts	
	partnership agreements	
	premium pricing	
	environmental or social benefits	

Adopted from Whalen (2020) Proposed a framework to illustrate circular business models elements. Developed from an empirical review of circular business models. *Note* value capture spans both columns, as similar approaches apply to both categories [12]

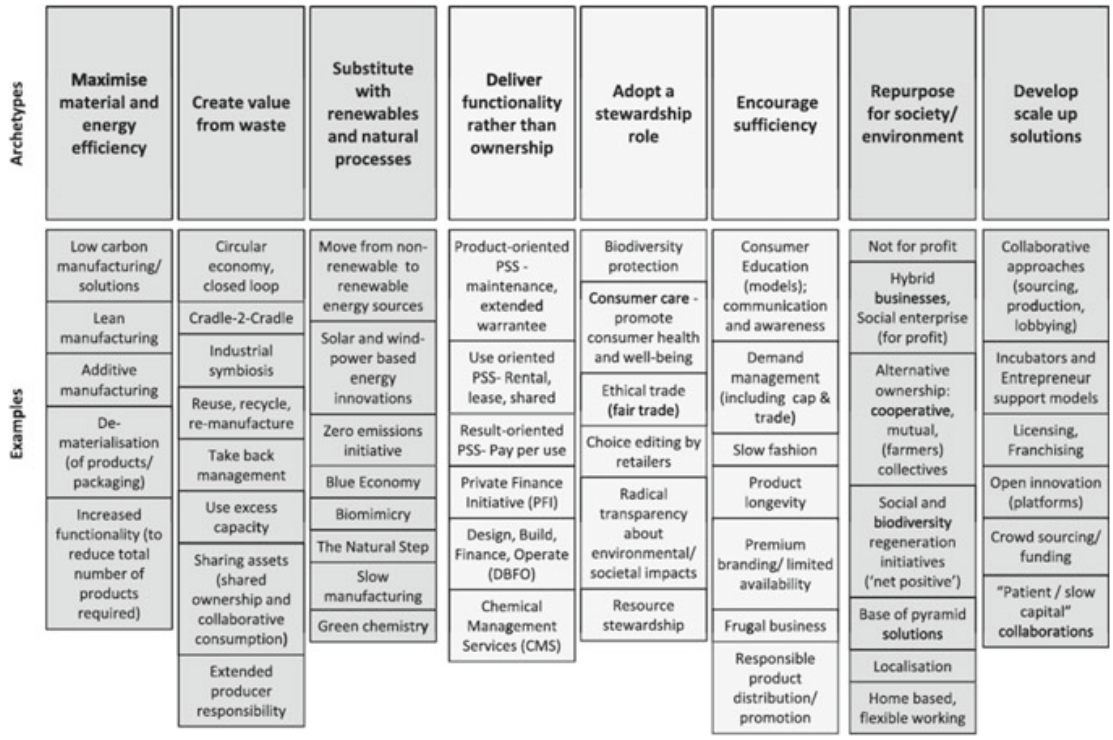


Fig. 6 Circular Business Models Archetypes adapted from Bocken et al. (2016)

loops includes product-life extension strategies such as maintenance, repair, refurbishment, and remanufacturing, while *closing resource loops* is linked to capturing the residual value from by-products or "waste" through business model innovation [14]. *Narrowing resource loops* focuses on reducing the demand for energy and resources, thereby reducing demand for primary extraction of resources, reducing waste to landfill, CO_2 emissions, and other pollutants. This latter approach contributes towards system-wide reduction of resource consumption, efficiency in material, and energy. However, optimization and efficiency implemented in silo, without regarding the system in which companies operate, generates rebound effects [15], and wider negative impacts. In addition, since productivity and efficiency in manufacturing often mean automatization and novel technology adoption, these trends have led to increased unemployment and resulting social sustainability issues [16]. Hence, CBM need to incorporate wider environmental and social considerations and aim at positive social impacts alongside environmental sustainability.

Case Study 1

Lehigh Technologies

Lehigh Technologies is a specialty chemicals company that produces highly engineered, versatile raw materials called micronized rubber powders (MRP) that can replace up to 20% of traditional oil-derived and rubber-based feedstocks in a wide range of applications. High-quality, micron-scale MRPs are suitable for a number of high-performance consumer and industrial applications, including tires, plastics,

Table 2 Theoretical archetype framework for CBMs

Archetype		Value proposition	Value creation & delivery	Value capture
CBM1	Access/Performance Model	Delivery of functionality or use instead of ownership	Lower cost of ownership to consumer; offers firms economic incentives to slow resource loops (perform maintenance, undertake repair)	Pay per unit of service; pay for functionality; pay per use
CBM2	Extending Product Value	Use and/or recovery of used products or components	Collection or redistribution or used products; perform repair; refurbishment; remanufacturing	New forms of value; reduced material or overall costs
CBM3	Classic Long Life	Offer long-lasting products	Durable, high-quality product and long-term customer service	Usually premium price
CBM4	Encourage Sufficiency	Encourage reduced consumption	Quality products, high levels of customer service; firm takes stance against obsolescence	Premium pricing due to slower sales
CBM5	Extending Resource Value	Use and/or recovery of wasted resources	Take-back; collection, recycling; recovery; and/or use of waste; often takes place at product level	Reduced material of overall costs
CBM6	Industrial Symbiosis	Waste outputs used as inputs	Outputs used as feedstock for different use; often takes place at manufacturing and process level to benefit business	Reduced operating cost; new business lines

Adapted from Bocken et al. (2016) and created by Whalen [12]

asphalt, and construction materials among others. Importantly, MRPs are a lower cost, sustainable alternative to virgin rubber and oil-based materials, providing a boost to the bottom line.

Lehigh Technologies developed an approach to value recovery from a waste-stream using proprietary cryogenic (freeze-dry) turbo mill technology that turns end-of-life tires into competitive feedstock for new products. As of April 2018, the company has manufactured over 500 million new tires using its circular model, reducing the amount of tires and post-industrial rubber discarded to landfills.

Every pound of Lehigh's MRP helps save: 10kwH of energy and 40% of the CO_2 produced with traditional alternatives [17].

The company is not only a manufacturer of specialty chemicals, but also a technology company and a provider of consulting services to their customers.

The company used the approach of closing resource loop for value proposition, creation and capture, and a narrowing resource loop during its manufacturing process.

Focus of value proposition here is Extending Resource Value—the company offers products made from recovered resources (i.e. old tires). The value is created and delivered via manufacturing of new products from recovered resource and the source of value captured is many fold—revenue from previously obsolete product (old tires destined to landfill), cost savings, service contracts, partnership agreements, and environmental and social benefits.

Credit: Lehigh Technologies business model (http://www.lehightechnologies.com)

Case Study 2

"Since 1959, Vitsœ has made long-living furniture, always striving to be better rather than newer"[18]. **Vitsœ** is a shelving and storage manufacturer and supplier. It was founded as a radical design-driven company, introducing a modular and timeless design philosophy to product design. Its vision is to manufacture furniture to last as long as possible, be adaptable and infinitely reusable, and not subject to fashion trends. The company specifically avoids built-in obsolescence and avoids fashionable furniture trends. Customers receive bespoke service through allocated personal planner to ensure that every detail is taken care of and… it's free of charge! The key ingredient is trust: customer trusts that the company has their best interest in mind, the product purchased now will be around for years to come, and they can purchase additional units as they need (when redecorating or moving to a different house). Company's products reflect longevity, durability, modularity, and long-term close relationships with customers. The furniture is made directly at their factory and delivered directly to the customer worldwide. Vitsœ takes a stand against inflated prices and following "discounts". In the absence of a middlemen, their markup is lower than the industry norm allowing customers to receive higher-quality furniture for this price via fair, honest price lists—"…the only difference between the price lists is the inclusion of the cost of our administration and packaging depending on the customer's location in the world".

This case illustrates Cradle to Cradle framework approach where network/system perspective is taken in design of the business model. At the basis of it is not only long-lived and durable furniture design manufactured in sustainable manner (reduced resource consumption and minimal environmental impact), but importantly, consumer education and awareness that encourages sufficiency—business that seeks to moderate overall resource consumption by curbing demand through education and consumer engagement. The company has 5 locations and ships its products to 60 countries around the world.

This company offers an example of a circular business model where sustainability is embedded throughout the business, with vision, value, and organizational culture (norms, values, and governance) driving the initiatives on sustainable consumption and production [2]. "Our reason for being: allowing more people to live better, with less that lasts longer. When you visit Vitsœ, you will find that we are walking the talk—everywhere. As I type, I can see our chef making use of the leftover food for another meal. How do you measure that? There are hundreds of similar examples—many too small to bother with. But they all add up."—says Mark Adams the Managing Director of Vitsœ.

Credit: Vitsœ

Case Study 3

Time Magazine wrote about them: *"The best part: no sizes."* The revolutionary process, offered in San Francisco and Hong Kong, eliminates inventory, fabric waste, and ill-fitting standardizations to provide the *only actually* sustainable model that exists.

Unspun®'s mission is to permanently alter design, manufacturing, and consumption of fashion utilizing technology. While doing so, they aim to reduce global carbon emissions by 1% (note: in 2019, global CO_2 emissions reached 36.8 Gt) [19]. On their website you can find the following statement: "We strive for global change and massive impact so ensure the planet continues to self-regulate and support all life".

What are they doing differently? First, there is no inventory—by focusing on designing timeless garments that won't go out of style, and are made only when someone asked for them (i.e. on-demand manufacturing). Second, they are implementing localized production, and third, use low impact fabrics. With these steps they are creating a future of closed loops, zero-waste supply chains where jeans can be disassembled and assembled again, meaning garments won't go to landfill/incineration after they've been worn down or no longer wanted.

Being only in the beginning of their journey, Unspun®'s jeans manufacturing process already emits **24% less CO_2**, compared to traditionally produced pair of jeans, based on Cradle-to-Grave Life Cycle Assessment (LCA) [20]. The dissolvable thread collaboration launched with Resortec® and paired with a 3D weaving project (not yet released) eliminates cut waste entirely and allows to dismantle and reuse the denim material. In the future, the company estimates that these innovations will reduce the CO_2 impact by 53%. That's over half the CO_2 per one pair of jeans.

The focus of Unspun®'s value proposition is offering durable products, as well as offering services related to these products and their recovery. Value creation and delivery is centered on "wear more, keep longer, and buy less" principles. Jeans are custom-made using the highest quality materials so that they last. If each person doubled the amount of times they wear a garment, Green House Gas (GHG) emissions would be 44% lower, which saves 36% of carbon per pair of jeans [21]. The company also offers repairs and alterations to ensure the longest wear.

The company captures value from premium pricing, environmental and social benefits, service offerings, and partnership agreements.

Credit: Unspun®

Case study 4

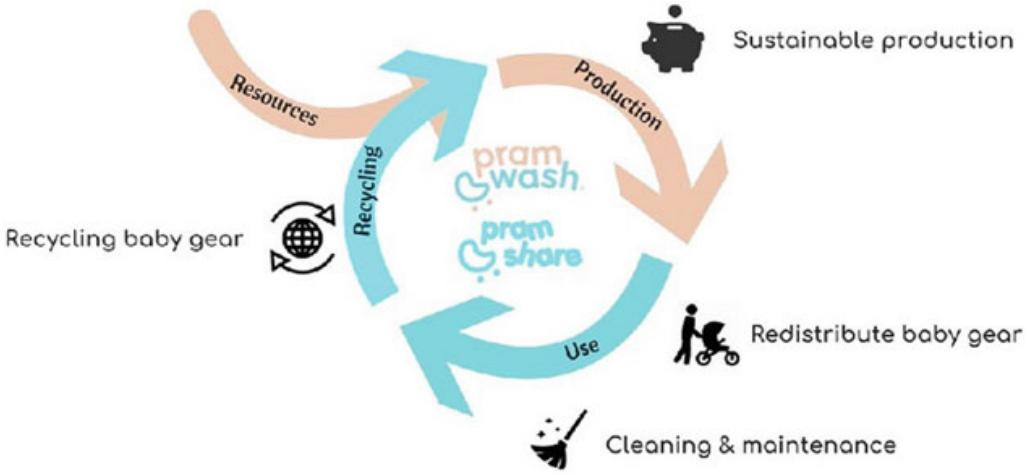
PramShare and **PramWash** were founded in Singapore, by newly minted parents that wanted to address challenge faced by many new parents—stranded prams, wasted materials, expensive baby gear, frequent equipment replacement, and maintenance—these pain points drove the founders of PramShare and PramWash to use a different approach to prams and their maintenance in Singapore, and provide parents with an enhanced user experience.

PramShare offers long-term and one-time rentals of high-quality prams, strollers, and car seats. Parents select the kind of gear they want to rent via the website, make a payment, and collect their rental at a designated self-pickup point or opt for delivery. While at PramWash, specialists do detailed cleaning of prams, strollers, baby carriers, car seats, play pens, and even soft toys.

A product-as-a-service business model that provides parents with high-quality prams, free of hassle of cleaning and maintaining, buying new gear, and stocking the old one, all while reducing waste and keeping materials in the value chain for as long as possible. Usually, at the end of the use of a pram, parents will dispose of it , where it will either end up in a landfill or will be incinerated. However, increasingly, parents choose to sell their prams or even give them away for free to other parents or companies like PramShare for continuous use. At the end of life, about 80% of a pram's materials can still be reclaimed and recycled into a new product.

The business model of PramShare draws inspiration from the sharing economy where customers rent products for the period of time they need them instead of owning the product. Through this approach, PramShare is able to maximize the use of their fleet of prams instead of the less efficient conventional business model where prams are sold to consumers, used for several months, and then are either disposed or left idling for months or even years.

PramShare applies the concept of circular economy to create value from underused products where they reuse and up-cycle used prams to fully working, as good-as-new condition. Recovering, recycling, and repairing used prams reduces environmental impacts by avoiding the need to extract and process raw materials in order to manufacture brand new prams. This value is captured through creation of new revenue stream from underused resources, results in cost savings for the company and customers, generates service contracts, and provides social and environmental benefits (original case study was published here [22].



Credit: PramShare

Questions

1. How to create a Circular Business Model?
2. How can circularity at the level of an organization can be assessed?

Answers

1. Shifting from linear to circular business models requires a fundamental system change. This process is called business model innovation. There are numerous tools available to assist with such endeavor. They range from generic a BMC tool (Fig. 3), tools for eco-design, for sustainable business modeling to game-based tools.
2. Earlier this year, Ellen McArthur Foundation released Circulytics [23] tool, calling it "the most comprehensive circularity measurement tool." It uses wide range of indicators across its entire operations and assigns a score card with comprehensive results that helps companies to track their results and level up their aspirations.

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