SUSTAINABLE BUSINESS MODELS

TECHNICAL INFORMATION FOCUSED ON BUSINESS TRENDS AND THE CREATION OF NEW TECHNOLOGY - BASED COMPANIES

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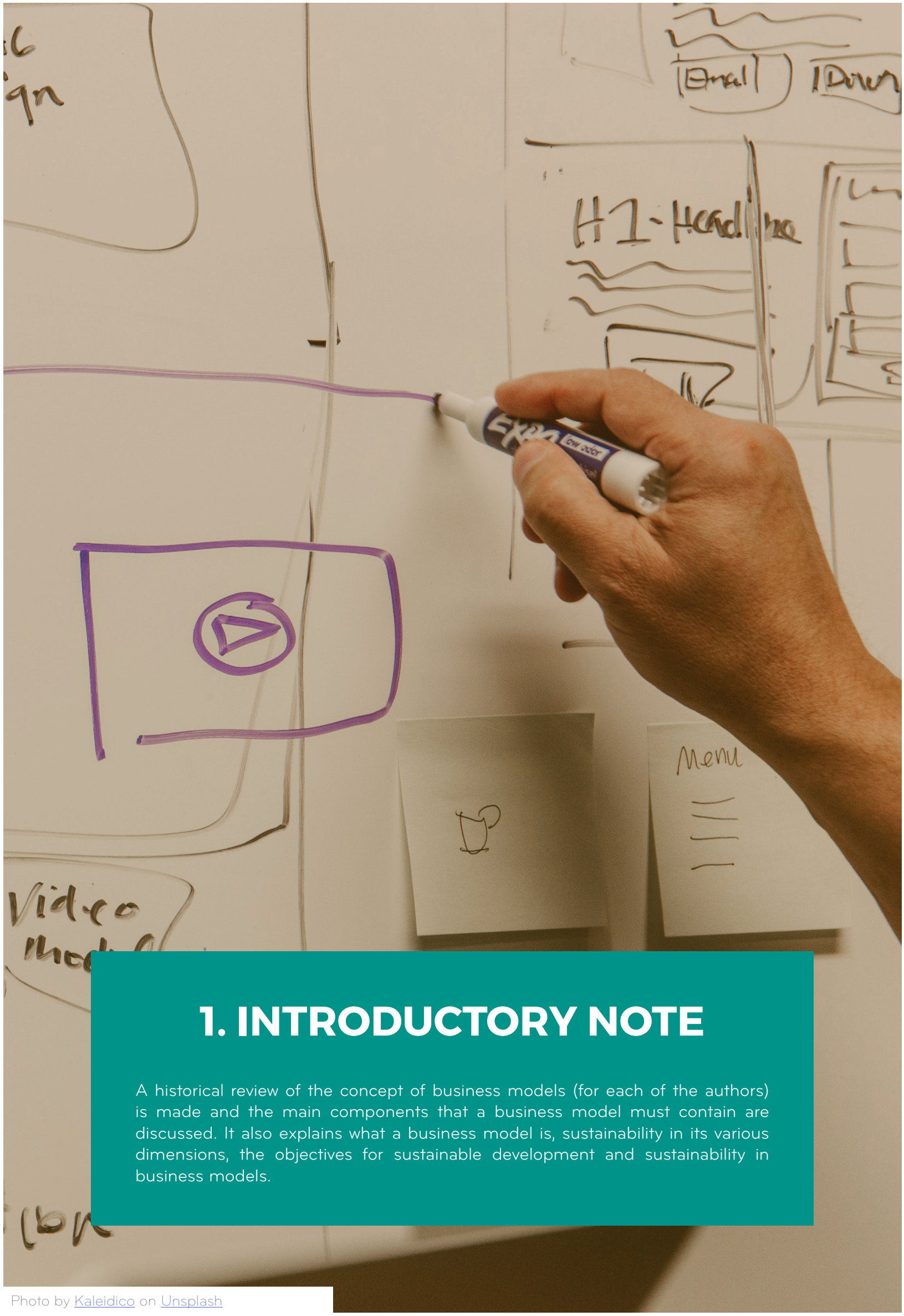

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1. INTRODUCTORY NOTE

A historical review of the concept of business models (for each of the authors) is made and the main components that a business model must contain are discussed. It also explains what a business model is, sustainability in its various dimensions, the objectives for sustainable development and sustainability in business models.

Keywords: Business models, Business Model Canvas, Sustainable Business Models, Triple layer business models (economic, environmental, and social), Sustainable Development Goals, Sustainability, Business Model Software tools, Business Model components, Types of Business Models.

1.1. Business Models

The **concept of business models** has assumed a high importance in recent years related to the growth of the concepts of innovation and entrepreneurship (Wirtz, Pistoia, Ullrich, & Göttel, 2016). Confirming this idea, the authors Massa, Tucci & Afuah (2017) note that the business model has become an increasingly used strategy tool, mainly in the areas of technology and innovation management, and also in relation to environmental sustainability and social entrepreneurship.

Teece (2010) defines the concept of business models as the definition, design, or architecture of the mechanisms of creation, delivery and value capture of a project or venture. Thus, according to Zott, Amit & Massa (2011), business models can play a central role in a company's performance and be a source of competitive advantage.

The term "business model" is relatively new and appears with Jones (1960), having been important for companies. From this time different definitions have emerged to explain the term and the role reflecting various perspectives, e.g., value creation, representation of company behaviour, etc. Amit et Zott (2001, p.4) define Business Model as "the content, structure and governance of transactions to create value by exploiting new business opportunities".

According to Casadesus-Masanell and Ricart (2010) business model is a representation of the logic and fundamental strategic choices of the company, in order to create and capture value from a value chain.

According to Teece (2010) **business model** "reflects the governance hypothesis about what customers want, how they want it, and how the company can organize itself to best meet those needs, be compensated for it, and make a profit".

According to Shafer et al. (2005) the concept of business model has been used in various ways as the description of a company's unique value proposition. According to the literature, there are numerous studies and considerations about the concept of business model. Thus, articles covering the years 1998-2015 were selected, and based on these articles, several definitions of business model and the authors who support them are presented (Table 1.1).

Table 1.1: Definitions of the Business Model concept

AUTHORS	DEFINITIONS OF THE BUSINESS MODEL CONCEPT
Timmers, 1998 (p. 4)	"The architecture for the products, services and information flow includes a description of various business actors and their roles; a description of the potential benefits to the various business actors and sources of revenue."
Venkatraman et Henderson (1998, p.33-34)	"A strategy that reflects the architecture of a virtual organisation on three main vectors: customer interaction, asset configuration and knowledge exploitation."
Linder et Cantrell (2000, p.1-2)	"The organization's core logic for value creation. The Business Model of a profit-oriented organization explains how it makes money."
Gordijn et al. (2000, p.41)	"It explains the creation and aggregation of value in a heterogeneous network of stakeholders, as well as the exchange of value between them."
Amit et Zott (2001, p.4)	"Describes the content, structure and governance of transactions to create value by exploiting new business opportunities."
Weill et Vitale (2001)	"A description of the roles and relationships between consumers, customers, partners and suppliers to identify a high product flow of information and money and benefits to participants."
Chesbrough et Rosenbloom (2002, p.532)	"Provides a coherent framework that takes the characteristics and potential of technology as input and converts them across customers and markets into economic output. The Business Model is conceived as a device that performs the intermediation between technology development and the creation of economic value."
Magretta (2002, p.4)	"... has a logical story explaining who the customers are, what they value and how the company will make money by providing value to them at an appropriate cost."

Hedman et Kalling (2003, p.49)	"A term generally used to describe the main components of a business: customers, competitors, suppliers, organization activities, resources, supply and production imports, as well as longitudinal process components to cover the dynamics of the business model over time."
Leem et al. (2004, p.78)	"A set of strategies for establishing and managing businesses, including revenue model, high-level business processes and alliances."
Yip (2004)	"Can be broadly defined as comprising these elements: value proposition; nature of inputs; how to transform inputs (including technology); nature of outputs; vertical scope; horizontal scope; geographic scope; nature of customers; how to organise"
Morris et al. (2005 p.727)	"It is a concise representation of how an interrelated set of decision variables in the areas of enterprise strategy, architecture and economics are approached to create sustainable competitive advantage in defined markets."
Osterwalder et al. (2005, p.17-18)	"A Business Model is a conceptual tool that contains a set of objects, concepts and their relationships for the purpose of expressing the business logic of a specific enterprise."
Shafer *et al*. (2005, p.202)	"A representation of the company's adjacent logic and strategic choices for creating and capturing value from a value network."
Kallio et al. (2006, p.282-283)	"A means by which a firm is able to create value to coordinate the flow of information, goods, and services among various industry participants, including customers, value chain partners, competitors, and government."
Johnson et al. (2008, p.6061)	"It consists of four interconnected elements: customer value proposition, profit formula, key resources- assets and key processes."
Casadesus Masanell et Ricart (2010, p. 196)	"Business model refers to the logic of the company, the way it operates and how it creates value for its stakeholders"

Rappa (2010, s.p.)	"In the most basic sense, a business model is the method of doing business by which a company can sustain itself - that is, generate revenue. The business model explains how a company makes money by specifying where it is positioned in the value chain"
Teece (2010 p. 179)	"A business model articulates the logic, data and other evidence that supports a value proposition for the customer and a viable revenue and cost structure for the company delivering that value"
Zott et al. (2011, p.1038)	"This provides a systemic approach to how to do business, considering activities that extend beyond company boundaries, with a focus on creating and capturing value."
Nielsen et Lund (2012, p.12)	"Coherence between the company's strategic choices that enable relationships for value creation for the operational, tactical and strategic levels."
Beattie and Smith (2013)	"Describes with a holistic description of how a company does business."
Hill and Jones (2013, p. 7)	"In essence, a business model is a type of mental model of how the various strategies and capital investments a company makes should be articulated to generate above-average profitability and profit growth."
Nielsen et Lund (2013, p. 60)	"It is the platform that allows strategic choices to become profitable."
Rothaermel (2015)	"Details how the company conducts its business with its buyers, suppliers and partners"

Source: *Adapted of Siqueira et Crispim (2011); Zott et al. (2011); Blaga (2015)*

Main components of a Business Model

The literature review presents several perspectives on the components of the **Business Model**, according to Demil and Lecocq (2010, p.227) "the concept of business model refers to the articulation between different areas of activity of a company aimed at producing a **value proposition** for customers."

Hamel (2000) suggests that the business model should describe the distinctive forces of an organisation to do business. Osterwalder (2004) mentions that the business model allows a new technology to be transformed into economic value, as it groups activities and components essential to create value for consumers and also allows the appropriation of part of that value. Thus, knowing the components of an organisation's business model facilitates the **perception of changes that need to be made**.

As Osterwalder and Pigneur (2010) describe a business model as a series of elements: the customer **segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure**. A Business Model is a sustainable way of doing business cited in Bocken, et al. (2014). And, the authors, in 2013, mentioned that strategic objectives should be defined and articulated as **strategic models according to decision making** to become increasingly complex.

Moreover, Beltramello et al. (2013, p.21) refer that "**value creation is at the core of any business model**"; usually, these companies "capture value by taking advantage of new business opportunities, new markets, and new revenue flow". And Sorescu, et al. (2011, p.S5) state that "**a business model is a well-specified system of interdependent structures**, activities and processes that serves as a firm's organizational logic for value creation (for its customers) and value appropriation (for the firm and for customers and partners).

Firms are increasingly exposed to rapidly changing business environments and increased competition (Van Oosterhout, Waarts, & Van Hillegersberg, 2006). External factors, such as **globalisation, competitive pressures, technological innovation**, among others, or internal drivers, such as a change in strategy or organisational structure, force firms to renew their business models (Verma & Jayasimha, 2014).

In contrast to more static classical approaches, a dynamic view of Business Model is mandatory (Wirtz et al, 2016). While some authors focus on more evolutionary changes in the business model (Demil and Lecocq, 2010), others stress the need for radical **reinvention of the business model** (Voelpel et al., 2004).

Demil and Lecocq (2010), state that a business model includes continuous dynamics through "interactions between and within the components of the core model". Cavalcante et al. (2011) further enhance this proposition and link business model dynamics and innovation. Differentiating four types of business model change: (1) **business model creation**, (2) **extension**, (3) **revision**, and (4) **termination** establish a direct link between these types of business model change and the corresponding degree of innovation (Cavalcante et al., 2011).

What is a business model?

A business model is a model that is used by a company of how it plans to make money from its product, service, or process identifying customers for a specific market. A business model explains four main aspects:

- What product or service a company will sell;
- How it intends to market that product or service;
- What kind of expenses the company will face;
- How the company expects to turn a profit.

There are various types of business, and it is necessary to verify the best model or models to apply to the products/services to be sold, those which can maximize profit in the short and medium term.

A popular example of a business model is the subscription model - in which companies charge a subscription fee (monthly, yearly etc.) for customers to access the service. For example, considering Netflix it is possible to break down based on the four aspects identified:

- What product or service the company will sell: Netflix sells an online streaming service;
- How it intends to market that product or service: Netflix uses a multi-channel marketing strategy and markets its service through social media, email, advertising and even simple marketing (word of mouth);
- What kind of costs it will incur: Costs will include the production or acquisition of content for the platform, the technology and the team needed to maintain the service;
- How profit is made: Profit is made by selling subscriptions.

It is important to ensure that the business can remain profitable, after considering the capital expenditure (CAPEX) and operating expenditure (OPEX) in the business model.

1.2. Sustainability

This section addresses the topic of sustainability in general and in its pillars (economic, environmental, and social) and also what the objectives of sustainable development are.

What is sustainability

Sustainability means meeting the needs of the current generation without compromising the ability of future generations to meet their needs.

In addition to natural resources, social and economic resources also need to be considered. When referring to sustainability it is commonly associated with environmental sustainability, but social equity and economic development are part of the definition of sustainability. The sustainability movement originated in social justice, conservationism, internationalism, and other movements of the past. In the late 20th century, many of these ideas gave rise to "sustainable development".

In 1983, the United Nations hired former Norwegian Prime Minister Gro Harlem Brundtland to head the new World Commission on the Environment. After four years, the "Brundtland Commission" released the final report defining sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their needs.

This Commission successfully unified environmentalism with social and economic concerns for the global development agenda.

Sustainability is a holistic approach that considers environmental, social and economic dimensions, recognizing that all must be considered together to find lasting prosperity in its fullness. To understand in a practical way, you can access the
vídeo.

The three pillars of sustainability consider the following definitions:

Environmental sustainability is the responsibility to conserve natural resources and protect global ecosystems to support health and wellbeing, now and in the future. Because so many decisions that impact the environment are not felt immediately, a key element of environmental sustainability is its forward-looking nature. The U.S.A. Environmental Protection Agency defines it as "meeting today's needs without compromising the ability of future generations to meet their needs" (https://sphera.com/glossary/what-is-environmental-sustainability/)

Economic sustainability is a broad set of decision-making principles and business practices aimed at achieving economic growth without engaging in the harmful environmental trade-offs that historically accompany growth. Ideally, sustainable development creates operational systems that consume natural capital (also known as natural resources) slowly enough that future generations can also use those resources.

Sustainable practices can tackle the problem of humans' collective ecological footprint in several ways, e.g., they can focus on reducing the depletion of the natural environment, by finding ways to reduce waste, limit carbon emissions, and utilize solar energy. The unifying principle of economic sustainability is rejecting wasteful short-term processes and embracing the planet's long-term well-being (https://www.masterclass.com/articles/economic-sustainability).

Social sustainability aims at ensuring the well-being, cohesion, equality, and development of society by creating inclusive infrastructure thanks to sustainable urban design, as well as products, and services that can benefit the community at large.

The social sustainability focuses on peace, improving social relationships, inclusion, and equality, preserving regional culture (cultural sustainability), and promoting honesty, and reciprocity within the local community. The social sustainable development supports the creation and development of communities with thriving social relationships and increased economic opportunities, while at the same time respecting the environment (https://sustainability-success.com/four-pillars-of-sustainability/).

Currently, public and private organizations have a sustainability plan and implement actions aimed at achieving sustainability in its various axes. In the strategic plans of these organizations, several initiatives and practices are developed to lead sustainability in its three axes.

Sustainable Development Goals

Due to the urgency to join efforts to achieve the main challenges related to social, economic, and environmental issues (worldwide), in September 2015, at the United Nations General Assembly, the, Agenda 2030, was defined, based on 17 Sustainable Development Goals (SDGs) (Figure 1.1).

Figure 1 Sustainable Development Goals
Source: https://anglicanmissions.org.nz/united-nations-sustainable-development-goals-sdgs/

For the fulfilment of the SDGs, cooperation is fundamental to mobilise the planet with attitudes that contribute to the eradication of poverty, environmental protection of the planet and better living conditions for all people.

The SDGs balance the three dimensions of sustainable development: the economic, social, and environmental.

The 17 Global Goals are subdivided into 169 targets, which comprise four main dimensions:

Social Dimension
It relates to human needs, such as health, education, justice, and actions for a better quality of life.

Environmental Dimension
This is related to actions for the preservation and conservation of the environment. Efforts are made to protect forests and biodiversity, the sustainable use of environmental resources and the creation of effective action plans against climate change.

Economic Dimension
Considers the use and extinction of natural resources that impact the world economy. In this dimension, actions on waste production and management, energy consumption, etc. are addressed.

Institutional Dimension
Considers the efforts necessary to put the SDGs into practice.

In a very practical and simple way, the global goals of the 17 SDGs are described.

ODS 1
End worldwide poverty (in all its forms)

ODS 2
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

ODS 3
Ensure healthy lives and promote well-being for all at all ages

ODS 4
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

ODS 5
Achieve gender equality and empower all women and girls

ODS 6
Ensure availability and sustainable management of water and sanitation for all

ODS 7
Ensure access to sustainable, reliable, and affordable energy for all

ODS 8
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

ODS 9
Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

ODS 10
Reduce inequality within and among countries

ODS 11
Make cities and human settlements inclusive, safe, resilient, and sustainable

ODS 12
Ensure sustainable consumption and production patterns

ODS 13
Take urgent action to combat climate change and its impacts

ODS 14
Conservation and sustainable use of the oceans, seas and marine resources for sustainable development

ODS 15
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

ODS 16
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels

ODS 17
Strengthen the means of implementation and revitalize the global partnership for sustainable development

The 2030 agenda is an opportunity to reinforce business values and show that the corporation can positively impact the world. It is essential that organisations find ways to link their business strategies with the SDGs. In this sense, it is necessary to create an action plan that goes through a deep business analysis, mapping the strategic and commercial priorities that relate to the SDGs.

On the other hand, a business in general cannot contribute to all SDGs, but to some of them. Thus, it is important to identify which goals are linked to the company's core business and how they can be applied in a practical way and in the company's routine.

Implementing the SDGs in the daily routine of companies is **a must** for the alignment with the United Nations Agenda 2030. An example of a guide for the application of the SDGs in companies can help from planning to implementation in the various stages of the value chain.

1.3. Sustainability in business models

Currently, sustainability in business models is essential to generate value in all parties involved, without the sole concern of a highly profitable business model, but which will tend to deplete natural resources, and also lead to the demotivation of social capital. In this sense, it is fundamental that the Business Model to be developed, whether for products, services, or processes (of any kind) can consider sustainability in its three axes as a fundamental objective, with a rigorous impact assessment and aligned with the SDGs.

To develop a sustainable business model, it is important to consider an effective and efficient Planning for a) **resources to be used**; b) **human resources and company structure** and c) **customers**.

Regarding the **resources to be used** it is important to make a list of raw materials according to the needs of the type of business, the place where each of these materials can be acquired, who produces and trades them and how they are transported.

This allows the identification of suppliers who tend to have less impact on the fuel used and, consequently, on the C02 produced. It is important to check which resources offer the greatest dependency and risk to your production and how you can reduce alternative supply mechanisms and whether there are local productions that can integrate suppliers.

When designing your business and manufacturing process adjust for resources by reviewing sustainability throughout the process and plan the changes you consider relevant to improve the sustainability of the business model of products, services or processes.

Another important aspect is the analysis of the **production process**, identifying waste and in which parts of the production system there is more waste and what the impact of this is.

In the **dispatch process to deliver products** to customers, it is important to define how they will be packaged and consider sustainable and/or biodegradable packaging, to reduce the negative impact on the environment.

Regarding **raw materials** and materials used in production, it is important to identify the less sustainable ones and define how to replace them by more sustainable ones and if it is possible to replace them in due time.

Regarding **waste materials**, it is important to check if it is possible to minimize this waste and the possible reuse of waste material, even considering new businesses.

The analysis of the **number of resources used** is a process that is important to develop in order to be sure that it is possible to do the same, guaranteeing the quality standards, but with less use of resources.

For the **human resources structure** and company, it is important to check aspects related to working conditions, salary compensation, employee motivation, their quality of life and that of their families, social plans, etc.

It is important that all employees are part of the business' sustainability goals and that innovation, intrapreneurship, sustainability, and team building actions are periodically developed to align the company's strategies in order to optimize the sustainability of the business models.

Regarding **customers**, it is important that they are involved in the sustainability of the business models because, probably, in an initial phase, the products, services or processes result in a higher value that they have to support, but having knowledge of the reason for that increase helps them to participate in the purchase and to be able to proudly announce the purchase of products that have a whole sustainable design and implementation rationale.

Also, the possibility of allocating a percentage of sales to organizations (e.g., NGOs) or charities is causes that customers (in general) like to be associated with. Another interesting approach is the crowdsourcing of sustainability ideas from consumers, which can be obtained through actions created for this purpose.

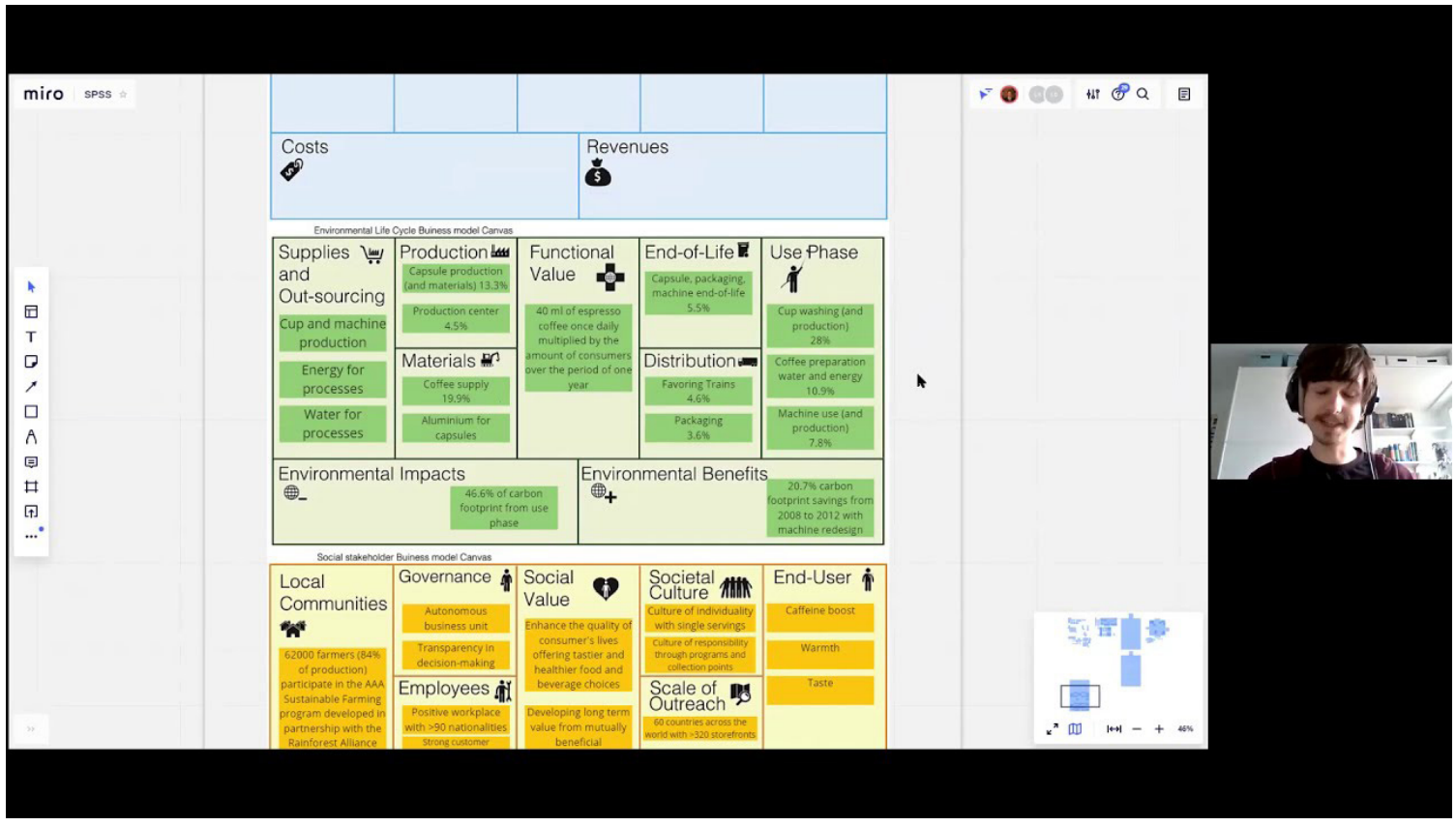
2. STRUCTURE OF BUSINESS MODELS

The structure of business models is addressed, and the business model canvas tool is explained in the economic, environmental, and social dimensions, with its components in each of the dimensions. Also, it is presented some examples of software tools, based on Canvas, to be used in the development of business plans. The approach for the development of Sustainable Business Plans is made.

Photo by Brands&People on Unsplash

The original business model framework is based on (Osterwalder & Pigneur, 2010), - who developed an innovative tool for planning business models, known as the Business Model Canvas (BMC).

When planning sustainable business models, triple-layer business model (TLBM) structures are used to analyze the economic, environmental, and social impact. TLBM expands the economy-centric approach to a normalized business model, integrating the environmental and social layers of the canvas, from a lifecycle and business stakeholder perspective. This approach supports the development of more robust and holistic perspectives on sustainability-oriented business model innovation. In this video you can approach the TLBM in a simple and integrated way.



For a better understanding, sections 2.1, 2.2 and 2.3 are explained, with the presentation of their main components, the economic, environmental, and social canvas business models, respectively.

2.1. Business Model Canvas - economic

The Business Model Canvas-BMC (economic layer) is intended to help the visualization with the representation of the elements of a business model and the potential connection and impacts on value creation. On the other hand, the BMC can agile the discussion, debate, and exploration of potential innovations for the business model itself. The BMC guide the creative phase of prototyping, obtaining feedback, and with the possibility to be constantly reviewing and updating the innovation of the business model. Figure 2.1 showss the business model canvas – economic layer.

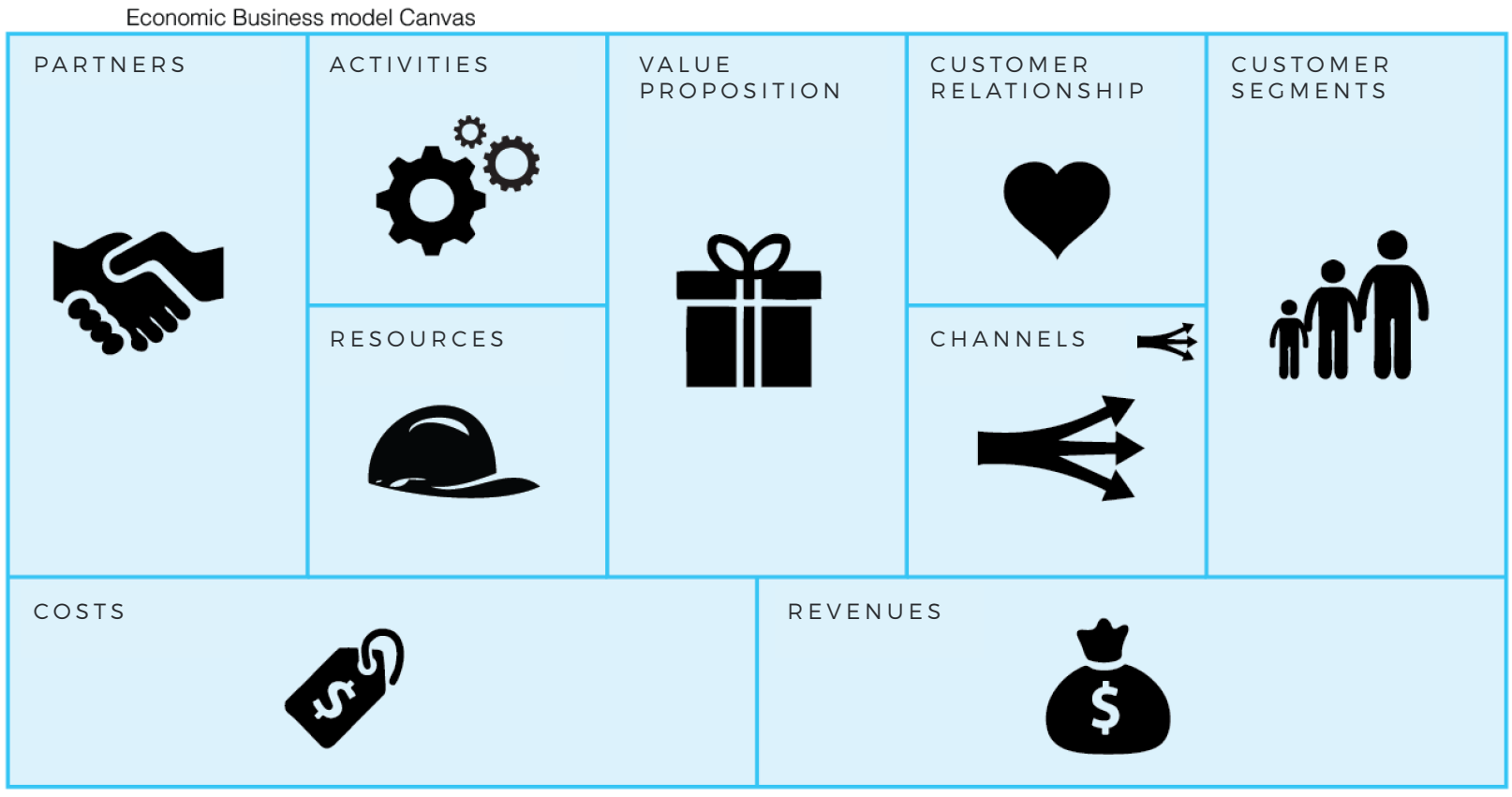


Figure 2.1 Business model Canvas – economic (economic layer)
Source: https://sustainablebusinessmodel.org/tag/business-model-canvas/

The **business models** may vary in form and function, but any model that has the potential to generate revenue contains essential elements that include a **value proposition**, a **viable target market** and a **competitive advantage**.

In business models it is necessary to consider revenue, production costs and other factors. To create a business model, it is necessary to consider the 9 components:

CUSTOMER SEGMENTS

These are the groups of people or companies that startup are trying to target and sell its product or service to.

Segmenting the customers based on similarities such as geographical area, gender, age, behaviors, interests, etc. gives the opportunity to better serve their needs, specifically by customizing the solution to be provided to them.

After a thorough analysis of the customer segments, it is possible to determine who the startup should serve and ignore. Then create customer personas for each of the selected customer segments.

There are different customer segments:

Mass market
A business model that focuses on mass markets doesn't group its customers into segments. Instead, it focuses on the general population or a large group of people with similar needs, e.g., a product like a phone.

Niche market
Here the focus is centered on a specific group of people with unique needs and traits. Here the value propositions, distribution channels, and customer relationships should be customized to meet their specific requirements, e.g., buyers of sports shoes.

Segmented
Based on slightly different needs, there could be different groups within the main customer segment. Accordingly, the startup creates different value propositions, distribution channels, etc. to meet the different needs of these segments.

Diversified
A diversified market segment includes customers with very different needs.

Multi-sided markets
this includes interdependent customer segments, e.g., a credit card company caters to both their credit card holders as well as merchants who accept those cards.

CUSTOMER RELATIONSHIPS

The type of relationship that is necessary to have with each customer segments or how it is the interaction with them throughout their journey with the startup.

There are several types of customer relationships:

Personal assistance
The startup interacts with the customer in person or by email, through phone call or other means.

Dedicated personal assistance
The startup assigns a dedicated customer representative to an individual customer.

Self-service
The startup maintains no relationship with the customer but provides what the customer needs to help themselves.

Automated services
This includes automated processes or machinery that helps customers perform services themselves.

Communities
These include online communities where customers can help each other solve their own problems regarding the product or service.

Co-creation
The startup allows the customer to get involved in the designing or development of the product, e.g., YouTube has given its users the opportunity to create content for its audience.

To understand the kind of relationship that the customer has with the startup can be through a customer journey map. It will help in the identification of the different stages your customers go through when interacting with the startup. It can help the startup make sense of how to acquire, retain and grow your customers.

CHANNELS

This describes how the startup communicates with and reach out to the customers. Channels are the touchpoints that let the customers connect with the startup.

Channels play a role in raising awareness of the products or services among customers and delivering the value propositions to them. Channels can also be used to allow customers the avenue to buy products or services and offer post-purchase support.

There are two types of channels:

Owned channels
startup website, social media sites, in-house sales, etc.

Partner channels
partner-owned websites, wholesale distribution, retail, etc.

REVENUE FLOW

Revenues streams are the sources from which a startup generates money by selling their product or service to the customers. This component describes how the startup will earn revenue from its value propositions.

A revenue stream can belong to one of the following revenue models:

Transaction-based revenue
made from customers who make a one-time payment

Recurring revenue
made from ongoing payments for continuing services or post-sale services

There are several ways you can generate revenue from:

Asset sales
by selling the rights of ownership for a product to a buyer

Licensing
customer pays to get permission to use the company's intellectual property

Usage fee
by charging the customer for the use of its product or service

Brokerage fees
revenue generated by acting as an intermediary between two or more parties

Subscription fee
by charging the customer for using its product regularly and consistently

Advertising
by charging the customer to advertise a product, service or brand using startup platforms

Lending/ leasing/ renting
the customer pays to get exclusive rights to use an asset for a fixed period of time

KEY ACTIVITIES

What are the activities/ tasks that need to be completed to fulfill the proposed business? In this section, the start-up should list down all the key activities that are needed to do to make the business model work.

These key activities should focus on fulfilling its value proposition, reaching customer segments and maintaining customer relationships, and generating revenue.

There are 3 categories of key activities:

Production
designing, manufacturing and delivering a product in significant quantities and/ or of superior quality.

Problem-solving
finding new solutions to individual problems faced by customers.

Platform/ network
Creating and maintaining platforms, e. g., Microsoft provides a reliable operating system to support third-party software products.

KEY RESOURCES

This is where the startup list down which key resources or the main inputs that are needed to carry out the key activities in order to create the value proposition.

There are several types of key resources:

Human
(employees)

Intellectual
(brand, patents, IP, copyright)

Financial
(cash, lines of credit, etc.)

Physical
(equipment, inventory, buildings)

KEY PARTNERS

Key partners are the external companies or suppliers that will help the startup to carry out the key activities. These partnerships are forged to reduce risks and acquire resources.

Types of partnerships are:

Strategic alliance
partnership between non-competitors

Joint ventures
partners developing a new business

Coopetition
strategic partnership between partners

Buyer-supplier relationships
ensure reliable supplies

COST STRUCTURE

In this, all the costs associated with operating the business model is identified.

The startup needs to focus on evaluating the cost of creating and delivering the value propositions, creating revenue streams, and maintaining customer relationships. And this will be easier to do so once that were defined the key resources, activities, and partners.

Businesses can either be cost-driven (focuses on minimizing costs whenever possible) and value-driven (focuses on providing maximum value to the customer).

VALUE PROPOSITIONS

This is the main of BMC. And it represents the unique solution (product or service) for a problem faced by a customer segment, or that creates value for the customer segment.

A value proposition should be unique or should be different from that of the competitors. If the startup is offering a new product, it should be innovative and disruptive. And if the startup is offering a product that already exists in the market, it should stand out with new features and attributes. Value propositions can be either quantitative (price and speed of service) or qualitative (customer experience or design).

These elements can change as the business evolves. As the business plan is fine-tuned, the components become more evident, and the business model provides a view of the business idea. It is important that the business model is analysed and rethought as the business develops and new strategies can be defined (always in an iterative process).

An explanatory vIdeo with BMC - economic can help in understanding these concepts.conceitos.

2.2. Business Model Canvas - environmental (environment layer)

The main objective of the Business Model Canvas - environmental (environment layer) is to assess how the organization generates more environmental benefits than environmental impacts, allowing the analysis of the organization's major environmental impacts within the business model. With this approach, it is possible to obtain insights to where the organization can focus attention when creating innovations focused on the environment. Environmental impacts can be verified through various indicators, e.g., carbon footprint, water footprint, noise footprint, and other footprints, depending on the product, service or process and the sectors of activity where these are in operation. Figure 2.2 shows the business model canvas - environment.

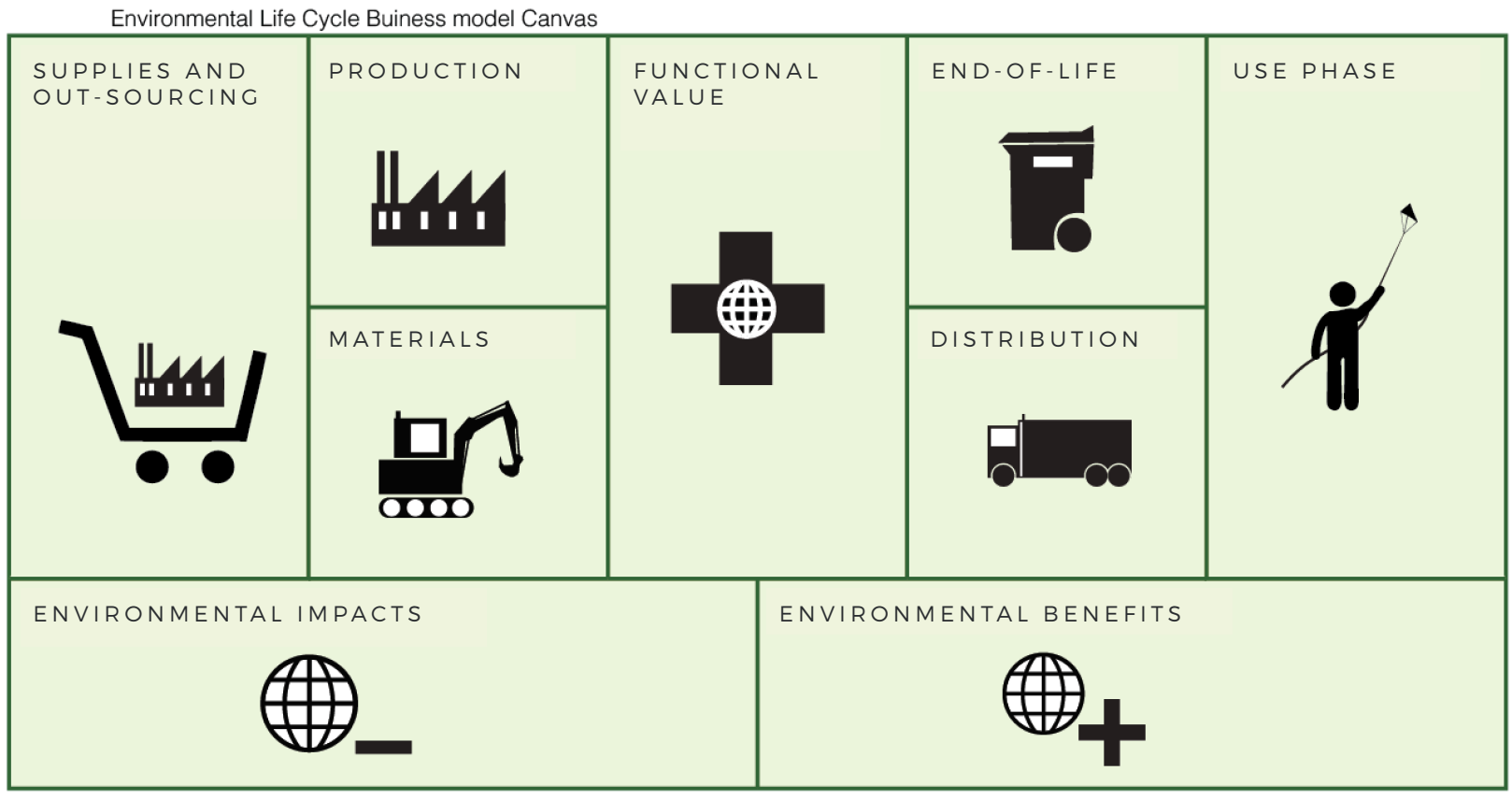


FigurE 2.2 Business Model Canvas - environmental (environment layer)
Source: https://sustainablebusinessmodel.org/tag/business-model-canvas/

The environment layer consists of nine components:

- **Functional Value**
  Describes the focal outputs of a service and emulates the functional unit in a life cycle assessment, which is a quantitative description of service performance;

- **Materials**
  Is the environmental extension of the key resources component of the business model canvas - economic. The idea is to describe the materials used and analyse the environmental impact of each of the materials to see if they can be replaced by others with a lower impact. Wherever quantification is possible it is relevant. The life cycle of materials is also important to analyse;

- **Production**
  Identifies the actions that the organisation implements to create value, e.g. may involve implementation of IT infrastructure, logistics, use of office space, storage, etc. The idea is to analyse the essential actions and what their environmental impact is for each of the actions, e.g. the production process;

- **Distribution**
  Involves the transport of goods (similarly to the economic layer), being important the analysis of the combination of transport modes, the distances covered and the weights of the loads. On the other hand, packaging and delivery logistics issues are important;

- **Supplies and Outsourcing**
  Represent all other materials and production activities that are necessary for functional value but are not considered "core" to the organisation;

- **Use Phase**
  The use phase focuses on the impact of customer participation on the organisation's functional value in the core service and/or product. This includes product maintenance and repair where relevant and should include some consideration of the customer's material resources and energy requirements during use;

- **End of Life**
  Is when the customer chooses to end the consumption of the functional value and often involves material reuse issues such as reproduction, reuse, recycling, disassembly, incineration or disposal of a product. From an environmental perspective, this component supports the organisation to explore ways to manage its impact by extending its responsibility beyond the initially designed value of its products. Increasingly governments are forcing organisations to act in accordance with substance restrictions and recycling requirements;

- **Environmental impacts**
  Address the ecological costs of the organisation's actions. Performance indicators may relate to biophysical measures such as CO2 emissions, human health, impact on the ecosystem, natural resource depletion, water consumption. Some environmental indicators may take the form of traditional business metrics;

- **Environmental benefits**
  Generalises the concept of value creation beyond purely financial value. It covers the ecological value that the organisation creates through reductions in environmental impact and even regenerative positive ecological value. From a sustainability perspective, this component provides space for an organisation to explicitly explore product, service and business model innovations that can reduce the negative environment and/or increase the positive one.

2.3. Business Model Canvas - social

The main objective of the Business Model Canvas - social (social layer) is to assess how the organization generates more benefits for the various stakeholders, namely with the main social impacts of the organization that derive from these relationships. With this analysis, it is intended to understand where the main social impacts of an organization are and obtain insights to explore new ways to innovate the organization's actions and business model to improve its potential to create social value. Figure 2.3 shows the business model canvas - social.

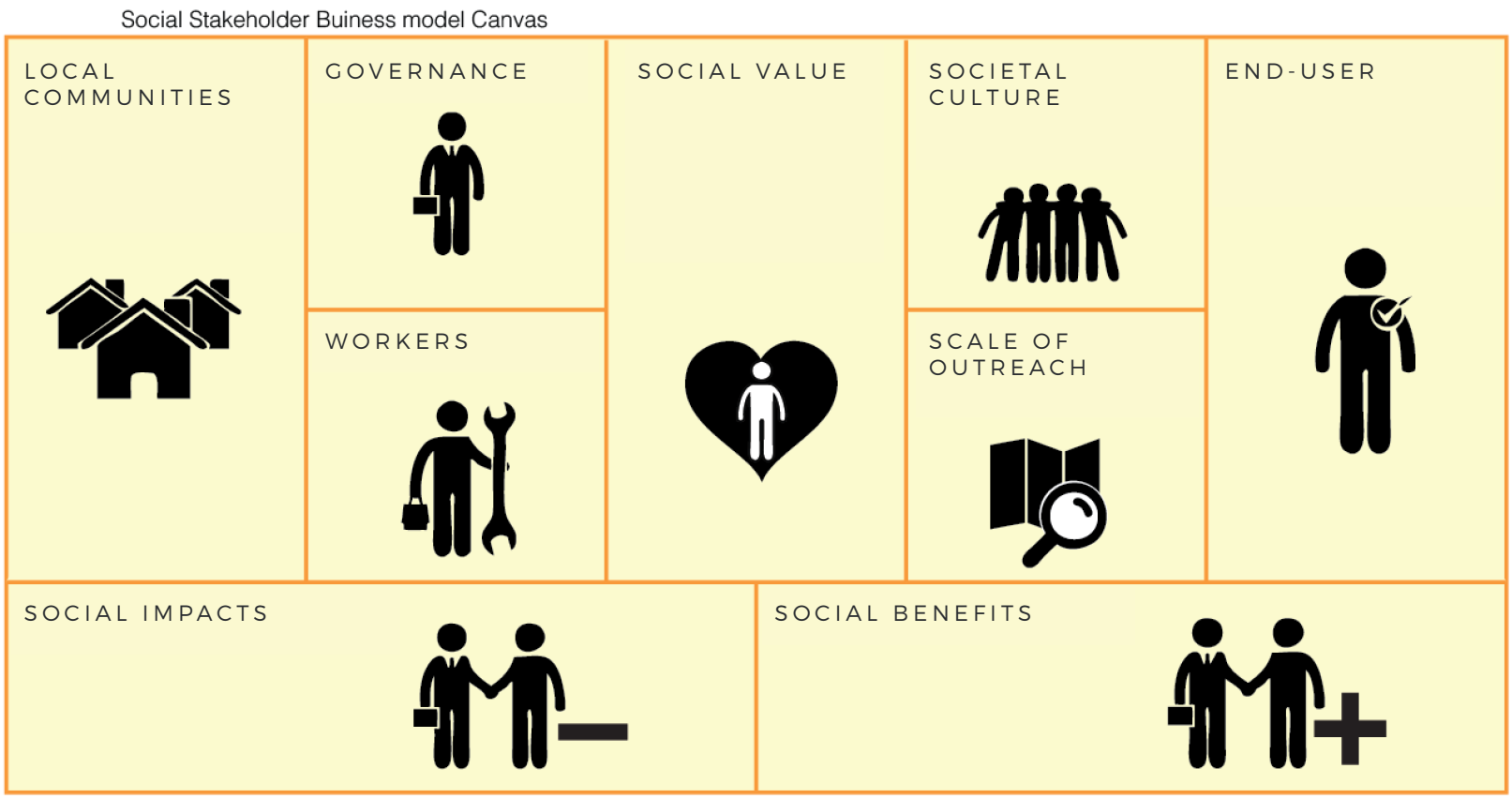


Figure 2.3 Business Model Canvas – social (social layer)
Source: https://sustainablebusinessmodel.org/2015/04/17/the-triple-layered-business-model-canvas-a-tool-to-design-more-sustainable-business-models/

The nine components of the social layer are as follows:

- **Social value**
  Relates to an organisation's mission and how it focuses on creating benefits for stakeholders and society (more broadly). A broader understanding of the company's social value can be extrapolated through its corporate business principles "to improve the quality of life of consumers";

- **Employees**
  Considers the role of employees as a central stakeholder of the organisation. Various elements can be included, e.g., quantities and types of employees, demographics, salary variations, gender, ethnicity, and education, within the organisation. Development of programmes targeted at an organisation's employees - e.g., training, professional development, additional support programmes, etc.;

- **Governance Organisational**
  Organizational structure and the decision-making policies of an organization. Governance defines which stakeholders it identifies and engages with, and how the organization is structured;

- **Communities**
  While economic relationships are built with business partners, social relationships can be built with suppliers and local communities. When interacting with communities, an organisation's success can be greatly influenced by developing and maintaining mutually beneficial relationships. An example is to consider that if an organisation has only one or several facilities located in the same geographical area, there may be only one local community. However, if an organization has facilities in different regions or countries, each community (as a different stakeholder), with different needs and cultural realities, tries to adapt to accommodate these variations across communities;

- **Social culture**
  ecognises the potential impact of an organisation on society as a whole. This component leverages the concept of sustainable value to recognise the potential impact of an organisation on society and through its actions, it can positively influence society;

- **Scale of reach**
  Describes the depth and breadth of relationships that an organisation builds with its stakeholders through actions over time. For example, the ability to develop integrative long-term relationships with impact that involves geographical dispersion and how it addresses social differences, such as local interpretation of ethical and/or cultural actions, in different cultures and countries;

- **End users**
  Is the person who "consumes" the value proposition. This space is concerned with how the value proposition addresses the needs of the end user, contributing to improve their quality of life. It is important to note that the end-user is the customer (defined in the economic layer of the business model), even if customer in the business model is different from end-consumer;

- **Social impacts**
  Address the social costs of an organisation. Some of the most common indicators include working hours, cultural heritage, health and safety, community bonding, fair competition, respect for intellectual property rights; respect for human rights;

- **Social benefits**
  Are the positive aspects of social value creation of the organisation's action. This component considers the social benefits that arise from an organisation's actions. Similar to social costs, social benefits can also be measured, e.g., the impact on personal development and community involvement by providing training opportunities for employees and also for suppliers and even customers.

2.4. Software tools for sustainable business models

This section refers to some software tools that can be used for business model planning.

- The Canvanizer has a whole software package that can be used for thinking, planning and developing the business model.
- The Altexsoft provides a BMC template that allows the automatic completion of each of the components.
- The Visual Paradigm is a simple and very visual software tool that is very interesting for developing business models (Figure 2.4).

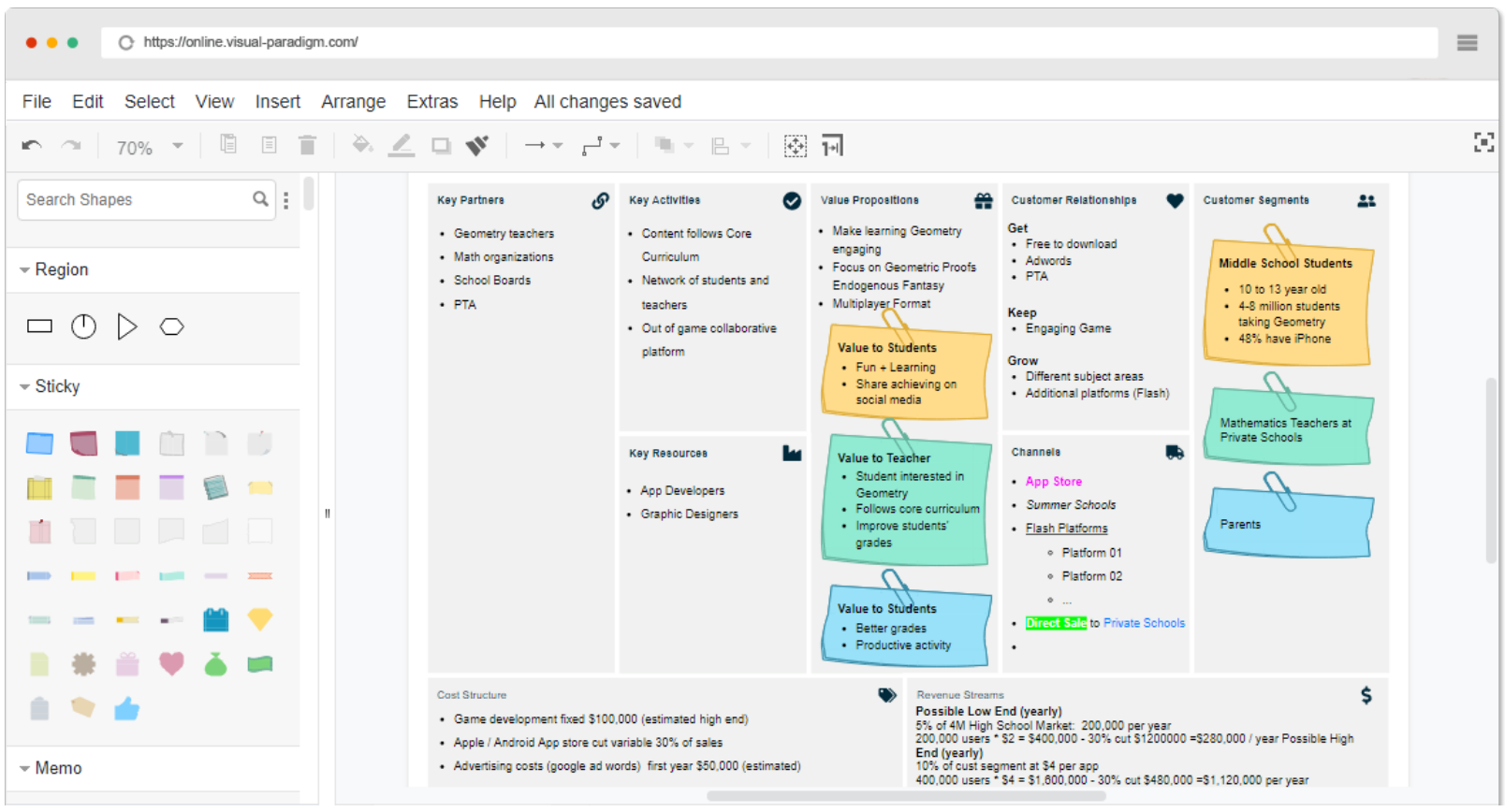


Figure 2.4 Visual Paradigm tool to develop business model canvas.
Source: https://online.visual-paradigm.com/pt/diagrams/features/business-model-canvas-software/

The Praxie is also another example of a planning tool for business models (Figure 2.5).

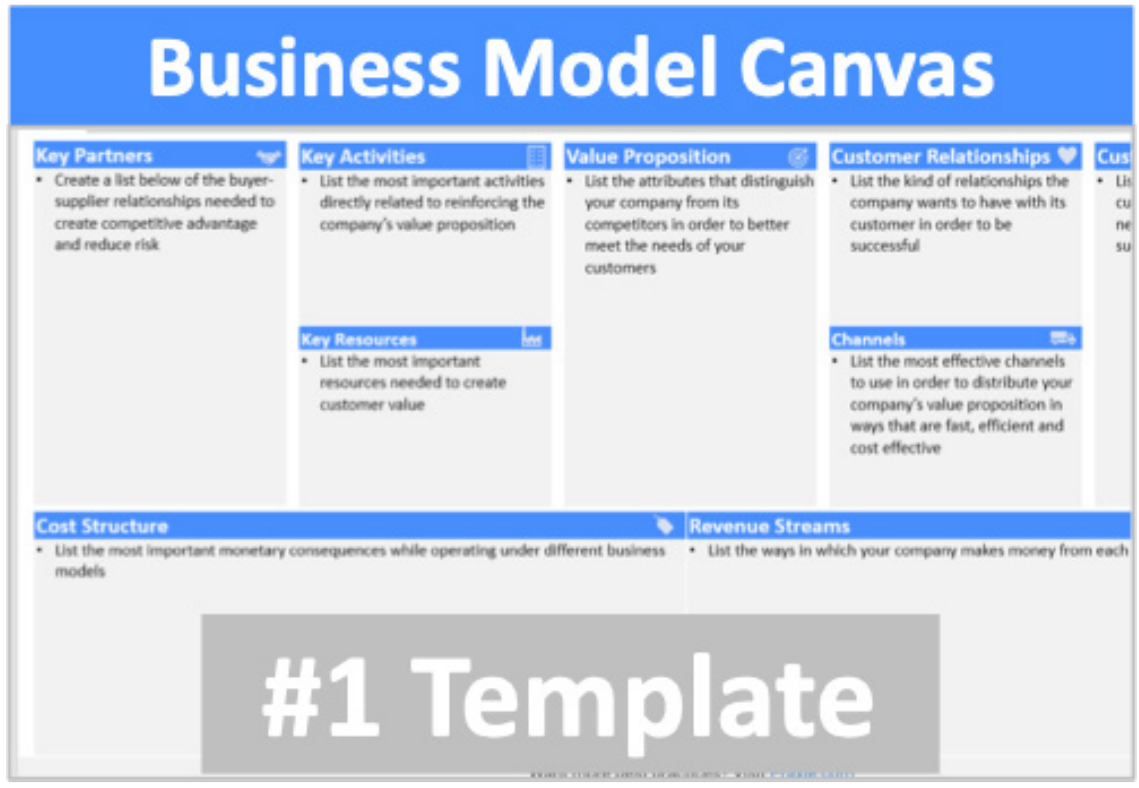


Figure 2.5 Praxie tool to develop business model canvas.
Source: https://praxie.com/online-business-model-canvas-design-tools-templates/

The Strategyser is a tool that allows visualisation and analysis of the business model and this one is widely used.

There are other tools for planning business models that follow the same concepts as BMC.

2.5. Proposal for the elaboration of sustainable business models

Following the AUDAX approach to implement the capacity building and mentoring actions, the methodology of sustainable business models is used, involving the triple-layer model. When each one components of the business model canvas - economic are analysed, the respective components in the environmental and social dimension are checked and also analised, i.e., corresponding to the same "square", in the BMCs for the various dimensions (Figure 2.6). With this approach, it is certain that during the initial planning phase and during the optimisation process, environmental and social components are never left behind.

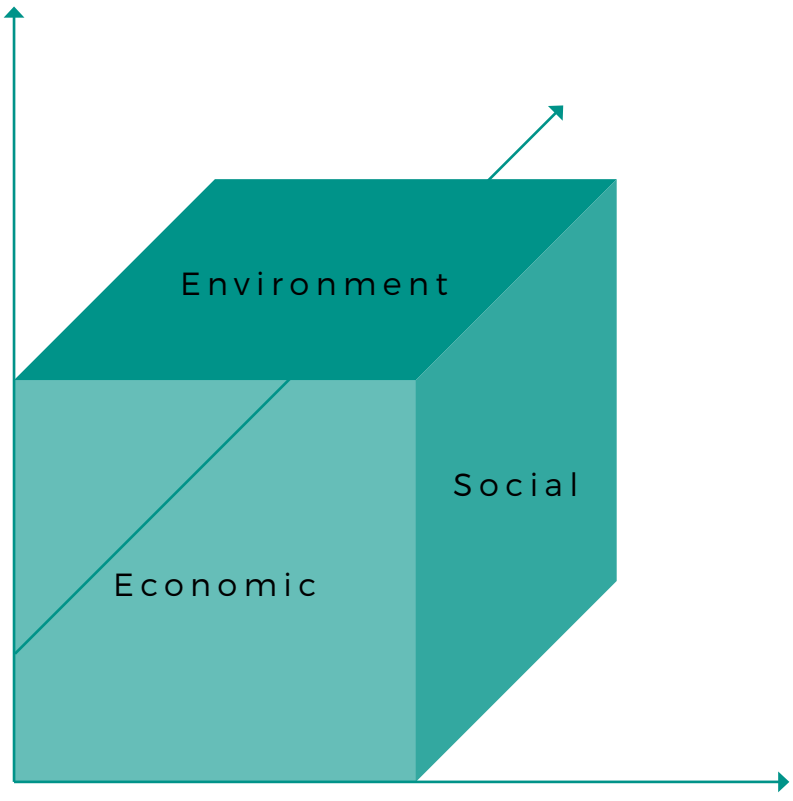


Figure 2.6 Triple Layer BMC Components (several dimensions).

The Process is repeated until all components are filled and discussed in the three dimensions.

Some exemples to fill the BMC can be find in (https://www.thepowermba.com/en/blog/business-model-canvas) considering the Zara, Netflix, Wine Industry and Vintae companies. Other 10 excelent examples can be seen in (https://blog.avada.io/resources/business-model-canvas-examples.html). A report of BMC for the google case is showed in (https://www.researchgate.net/publication/301675127_Business_Model_Canvas_Google_Report).

After the first phase, where all the components are filled, an analysis is done on all the components to enter the optimization phase, still in planning, after discussing and having the feedback. This algorithm is repeated throughout the various phases (planning and implementation) to bring the product, process, or service to the market (Figure 2.7).

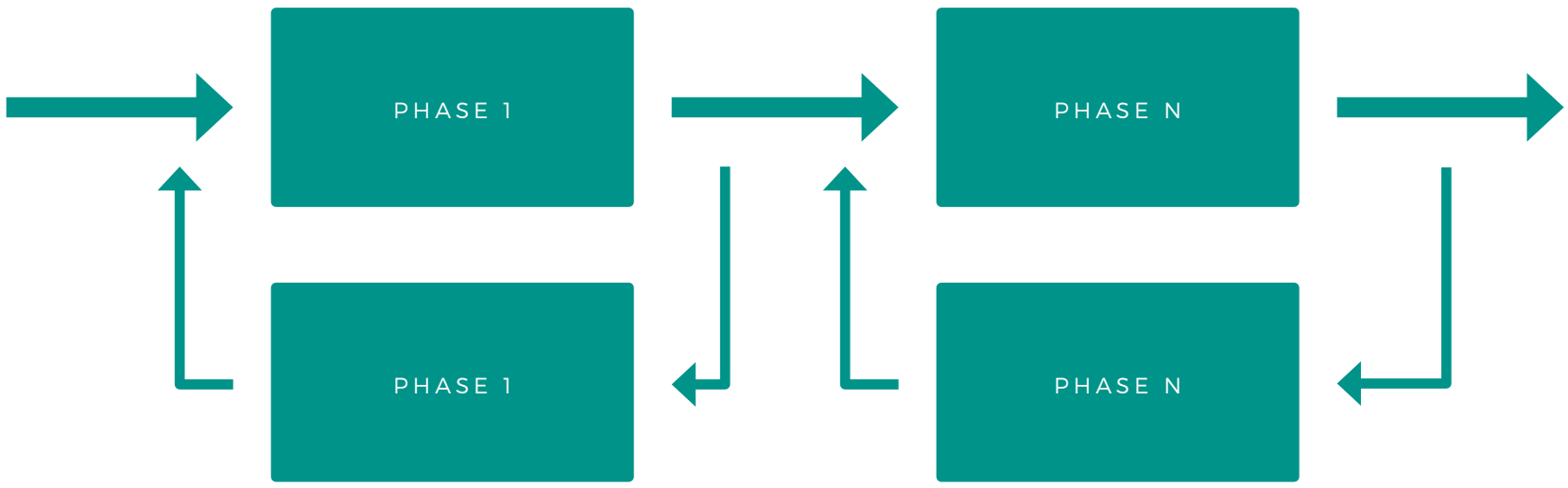


Figure 2.7 Algorithm with "feedback" in the phases of planning and implementation considering each component in the various dimensions of the triple-layer BMC.

Lesson to be learned when developing a sustainable business model in planning and implementation phases, considering the BMC in its three dimensions (economic, environmental and social):

- Step 1 (phase 1)
  - Complete the economic, environmental and social BMC;
  - Debate and record highlights to be made;
  - Based on the highlights, make changes to the BMC in the 3 dimensions.

- Step 2 (phase 2)
  - Modify the economic, environmental and social BMC according to needs;
  - Debate and record changes to be made;
  - Based on the changes, proceed to update the BMC in the dimensions, or in the dimension.

- Step N (phase n)
  During the life of the project, or business, it will be important to update over time, where at defined moments (scheduled for this purpose, with periodicity from month to month, or when necessary, validate or update the BMC in its three dimensions, involving the structure of the startup and its stakeholders, according to their importance to each BMC components.

This is a process that is always active and that accompanies the startup's activity.

Some examples of three dimensions of BMC is showed in links:
(https://www.youtube.com/watch?v=DpnbqBD8bVA)
(https://www.youtube.com/watch?v=gVimMEI2u2w)
(https://www.youtube.com/watch?v=fYhpfI_JIMU)

3. TYPES OF BUSINESS MODELS

In order to facilitate the identification of the most suitable business model, a wide range of types of models are presented, with examples of companies that have adopted their type of model. Some tips for choosing these models are also given.

Photo by Nathan Dumlao on Unsplash

3.1. Types of business models

There are various types of business models and this section aims to give an overview of the most commonly used Types of business models (fundsnetservices, 2022).

Subscription Business Model

The subscription model is one of the predominant business models for software companies. When done correctly, the subscription model is a model with a lot of value for **business growth**.

This type of business model charges customers a recurring fee - usually monthly or annually - to have access to a product or service. Revenue is collected automatically.

Some examples of subscription-based businesses, e.g., Netflix , Hulu, Disney+, HelloFresh, among others.

Online businesses and the use of **IT tools** are very common featuring free and other premium services, but already with subscription revenues.

Barkyn

Barkyn is a Portuguese company that, based on a subscription model, sends pet food in the comfort of your home. The price doesn't just include food. It includes an online veterinarian who clarifies doubts and questions about the pet, through an online chat. The whole experience is unique and perfect. Along with the ration comes a toy and snacks, improving the customer's experience. The way to pay is quick, easy and intuitive, and the recurrence with which the client receive the food at home is calculated according to the weight of the dog, age and breed, with personalized ingredients.

Package Business Model

The package model is one of the models that facilitates the convenient purchase of various products and/or services in a "bundle".

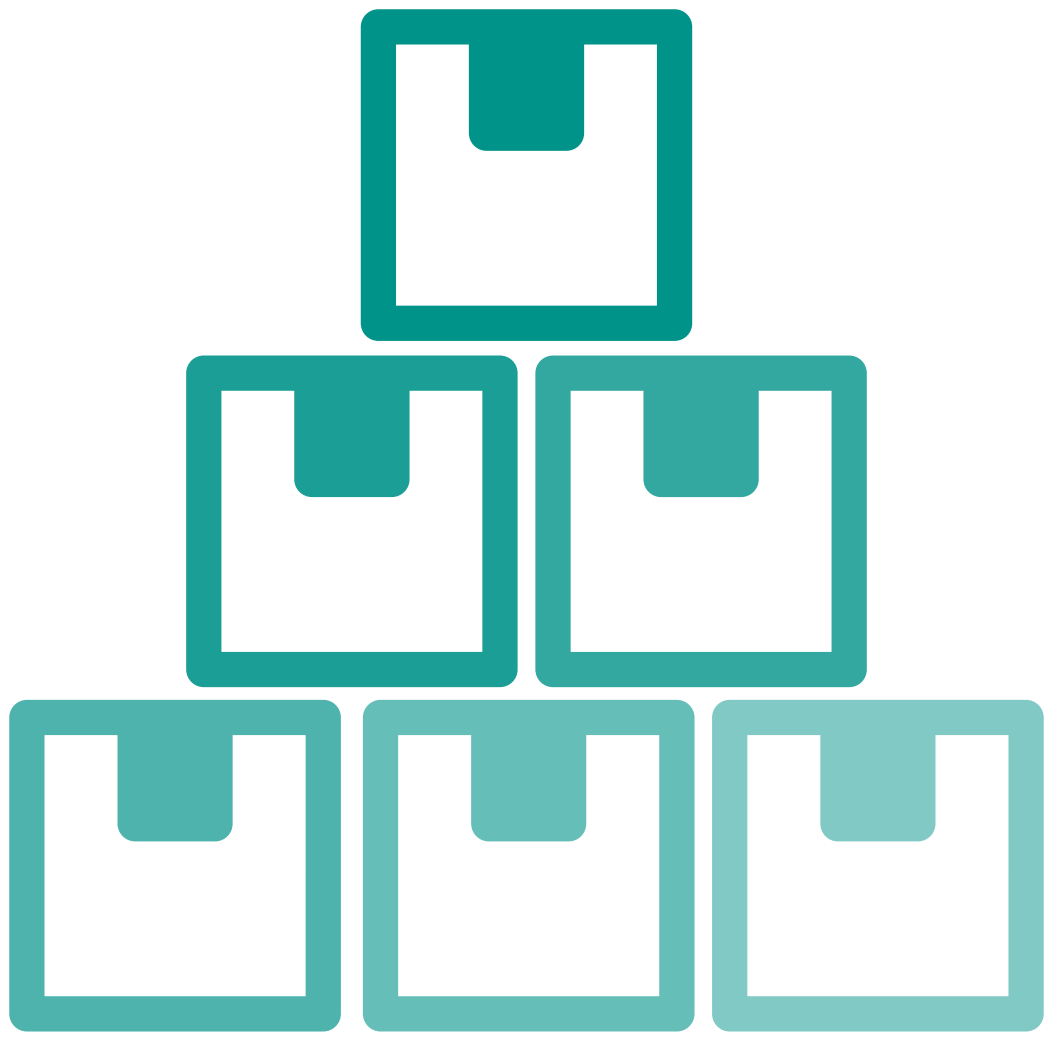
Some examples of companies that use the package model are fast food companies, e.g., McDonalds or Burger King that offer full meals.

Other examples of bundling are computer packages that offer monitor, mouse, keyboard and pre-loaded software at a single price.

Companies may choose to **bundle goods for various reasons**, including cost efficiency, market opportunities to increase profits and competitive strategy.

With a competitive strategy in mind, one may bundle a newer, or less successful, product/service with the stronger product/service as a means of opening up opportunities in new markets for products that have a need for market traction.

Another example, in the area of software, are packages of various software tools from the same company or group of companies. A very well-known case is Microsoft's software, in which they bundled Access and PowerPoint with Word and Excel, which were very well known and widely used. They also bundled the Internet browser with the Windows operating system (which was already the market leader). After this strategy, in just one year they increased their market share from 7% to 38%.

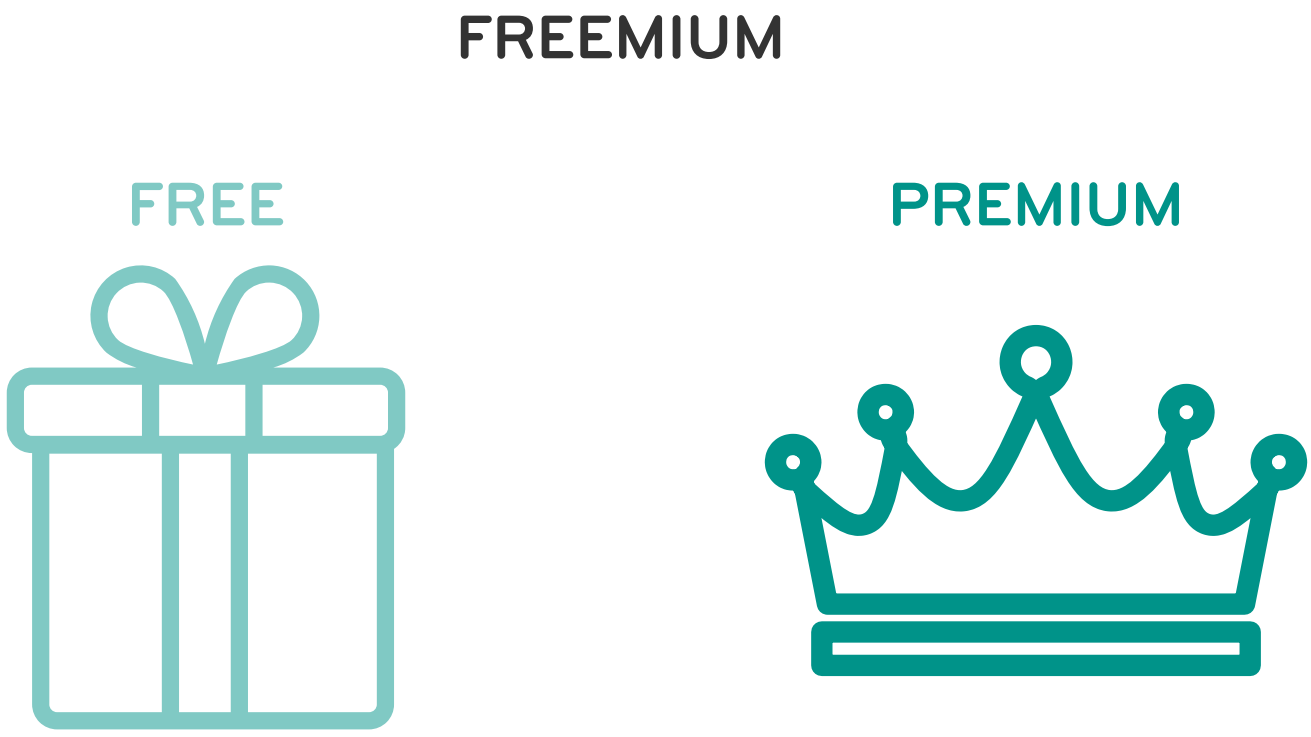


Freemium Business Model

The **Freemium** model, despite having appeared about thirty years ago, became more expressive through companies that develop and sell software. The freemium model works in several ways, but most companies offer a "free trial" of the product/service that involves some features and another paid portion for other features of greater interest.

Some examples of companies using this model include Pandora (free listening with ads and limited song choices), Skype and Spotify.

Another example is companies offering software as a service (SaaS) that prefer to use this model to offer a free trial of the software (for a 30-day trial period) to convince the customer to subscribe to the tool.



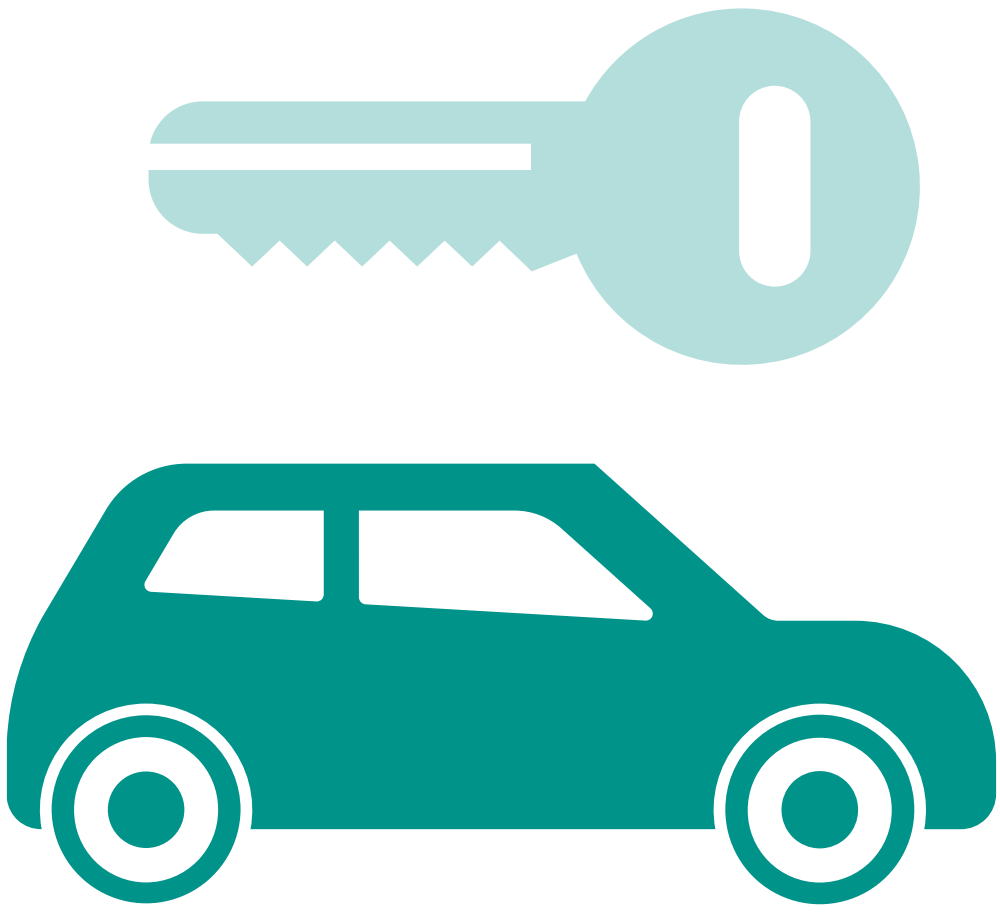
Leasing Business Model

The **Leasing model**, despite having specific markets, can be a very profitable model and of widespread use. This model basically consists in the acquisition of a product / service by the company and this rents to the customer for a rent, typically monthly or annually.

Some examples include car rental companies, holiday home rental companies, among others. Other companies that use this model include computer and equipment leasing companies and companies that lease other equipment for industry and medical equipment, which often have maintenance packages included.

Leasing models are interesting as they allow customers who need these products/services to use them without having to make an initial investment (CAPEX) and turn this cost into an operating cost (OPEX).

Some examples are the vehicle sector uses this type of business model a lot. Other areas and sectors have also been adopting this model, where the consumer will use according to his needs.



Product-to-service business models

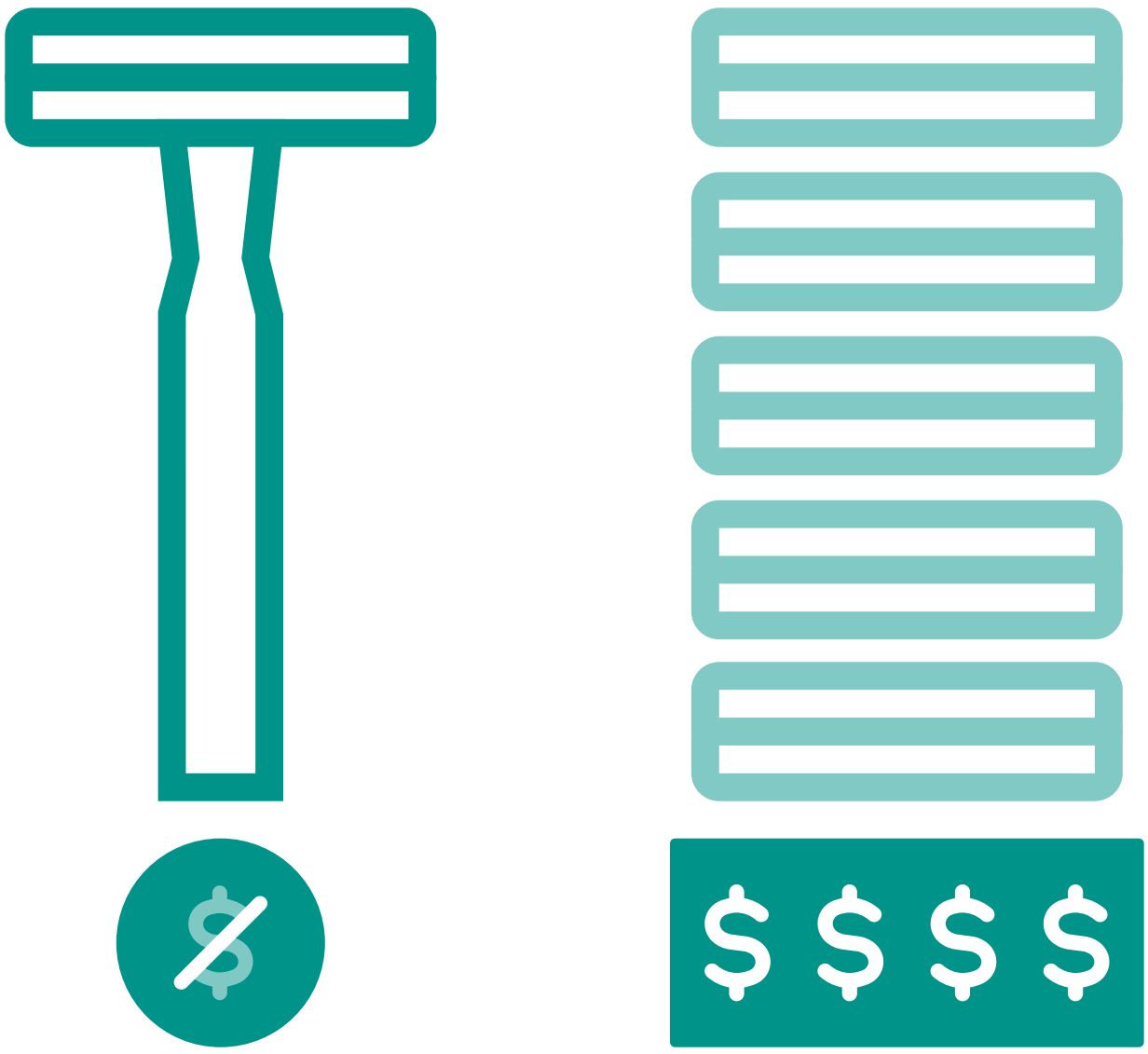
Have gained popularity because it allows customers to buy an outcome rather than a product.

Some examples are companies like UBER that have had huge success with this model. A customer needs to get from location A to B but doesn't have a "product" (transportation) to get there. Uber provides the product (transportation) through a service to achieve a certain result for their customer.

"Razor Blades" business model

The **"Razor Blades" business model** relies on selling the product very cheaply, but the accessories and replacement materials already have a higher associated value that will leave an economic margin.

Some examples are printer manufacturer companies that sell the printer very cheaply and then the ink cartridges with expensive value. Home appliances and their accessories often rely on this model.



The Franchising Model

The Franshising Model is one of the best-known models around the world, since in catering, clothing shops and other types of commerce it is a very present business model. This model consists in the acquisition by the buyer who will have to meet certain contractual conditions to reproduce that business. In this model, the company that sells the franchise actively collaborates with the buyer in terms of obtaining financing, marketing and other commercial operations that lead to the success of the business. The buyer will share a percentage of the margin with the seller of the franchise.

Some examples are McDonalds, Subway, Starbucks, 7-Eleven, etc.

Crowdsourcing Model

The Crowdsourcing Model is based on receiving information, work, comments, suggestions from a network of different people using the internet or various social networks. These types of business models allow companies to access a network of experts without hiring resources to perform various tasks.

- Some examples of crowdsourcing are **Doritos**, which was one of the first brands to use the power of crowdsourcing in advertising. This brand used contests with prizes that allowed the partner to participate in the brand's advertisements. This type of crowdsourcing allowed Doritos to gather innovative ideas from its customers and transform them into relevance and visibility for the brand. This is an excellent example of how to use collective knowledge and expertise to create more effective and efficient ads;

- Another example is **Starbucks**, which noted that its most creative customers were in the habit of drawing on the disposable white cup of drinks, producing inspiring art. In this sense, it launched contests that encouraged customers to create a unique design for the cup, take a photo and share it on social networks;

- **Lay**'s engaged consumers in defining which flavor they would like for their next fries;

- **Airbnb** is another inspiring example among crowdsourcing models, which uses the concept in its business model and marketing actions. The idea was to invite travelers to visit the city and use Airbnb to find accommodation;

- **Waze** defines itself as "the crowdsourced navigation app powered by the world's largest community of drivers". The service itself is a success story, as it uses user data to monitor traffic in real time in over 185 countries. Waze has managed to create a huge self-organizing community that helps keep the service at the top of its class;

- Another example is the **Oxford Dictionary**, which is one of the most famous cases of crowdsourcing. In this model, thousands of volunteers were summoned to help build the dictionary in 1878. Basically, participants were given a letter of the alphabet and had to look up all the words starting with that letter in their textbooks. With this initiative, more than 400,000 entries were collected, completing the work in 1948;

- Currently, **Wikipedia** is another successful example of an encyclopedia built from crowdsourcing, with thousands of contributors across the planet.

In addition to boosting business results, crowdsourcing also brings great benefits to society. In the health area, for example, the approach has been applied to innovate medicine and advance in the cure of diseases such as cancer.

The best example is one of the cases at the Dana-Farber/Harvard Cancer Center, in which scientists at the institute have developed a promising artificial intelligence tool that can automate the mapping of lung cancer.

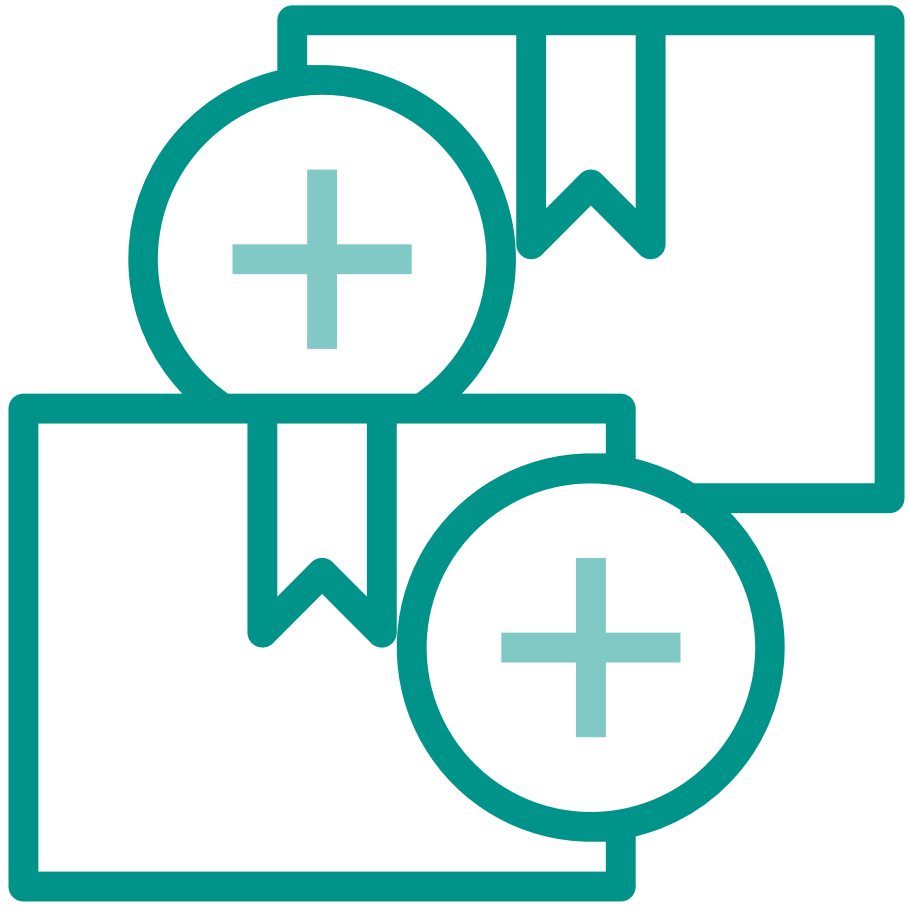
To do so, they enlisted oncologists to build the algorithm based on patient CT scans. Participating physicians had to manually bypass tumors in hundreds of scans so the system could cross-reference the data and develop patterns for automation.

Thus, with the collective contribution and the AI tool, it is possible to identify tumors in CT scans with high precision and quickly, streamlining the treatment and facilitating the work of oncologists (https://www.poderdaescuta.com/10-cases-de-crowdsourcing-com-resultados-incriveis-2019/).

Buy One and Offer One Model

The **Buy One and Offer One Model** is based on buying one product/service is offered another for a social cause. This type of model attracts customers who want to be socially correct or like to give back. This model allows the company and customers to participate in philanthropic efforts with the purchase of product they want or need.

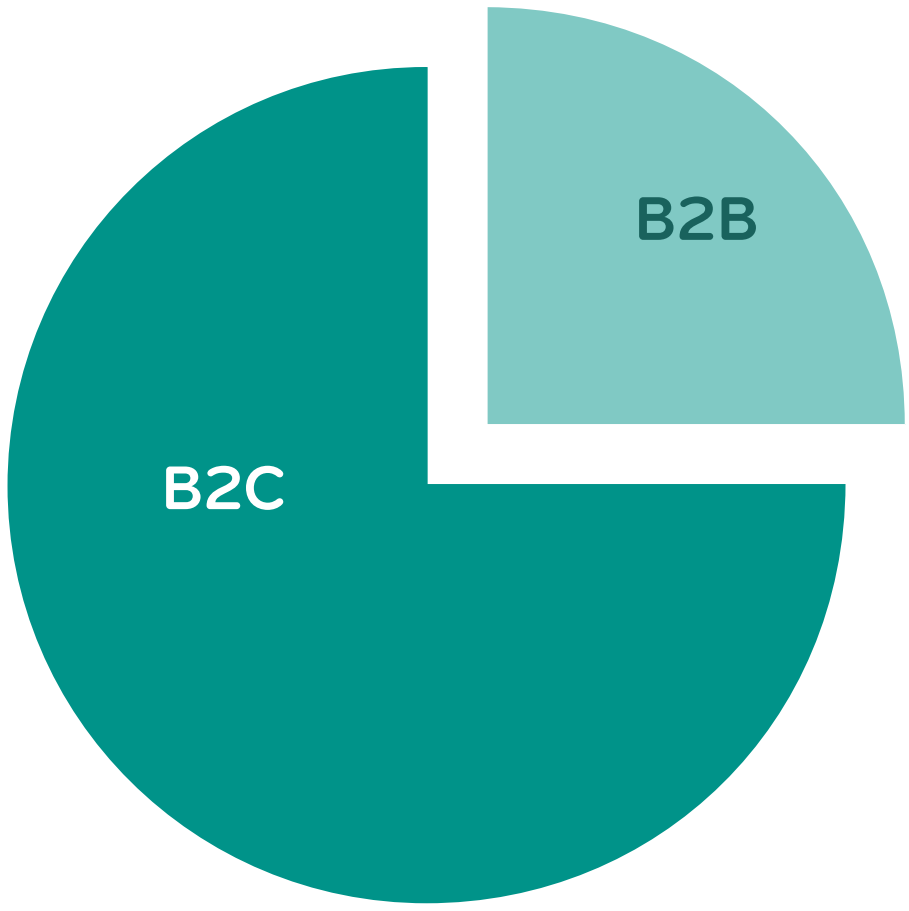
Some examples of companies using this model are Toms Shoes, Warby Parker and SoapBox.



Distribution model

Is based on a company wishing to distribute products manufactured by third party companies. This model can have distribution in specific markets or globally, depending on the distribution agreement. The Distribution Model can be directly to the consumer or to companies that will market directly to consumers.

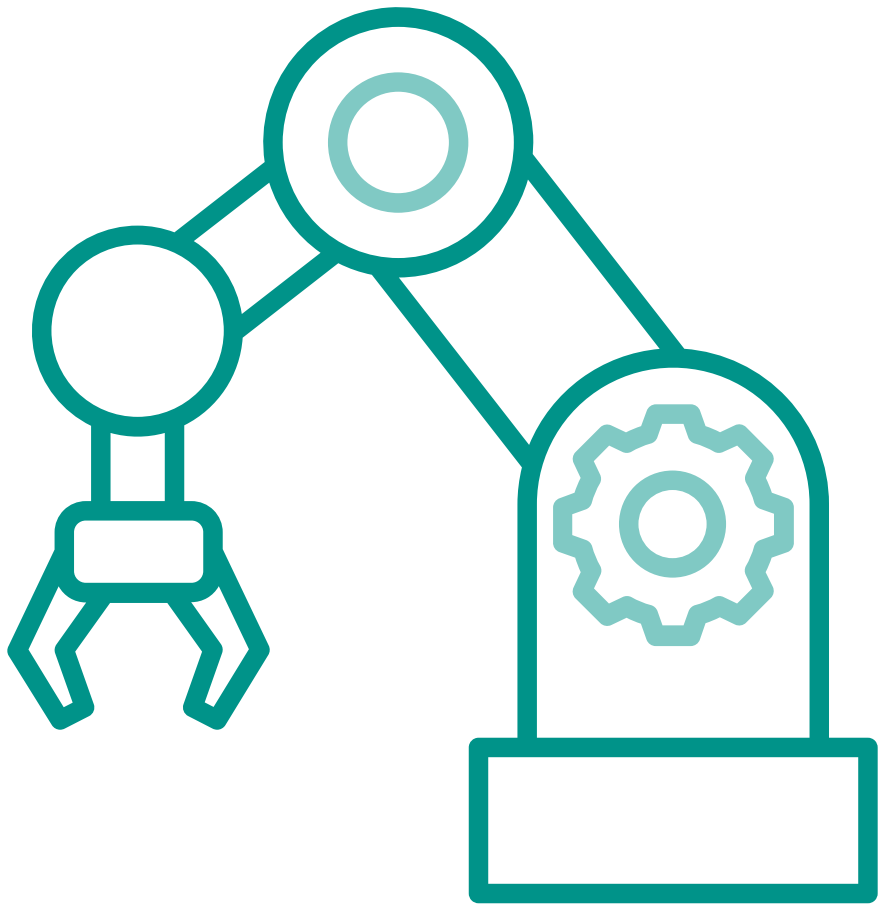
Some examples of companies that use this model are Worten, Fnac and other national distributors and representatives, e.g., BMW, Audi, Volksagen, Peugeot, FIAT, etc.



The Manufacturing Model

Is based on models of transforming raw material into final product and selling directly to the customer or to other companies that enter the value chain to do their business. This type of business model can also involve the assembly of prefabricated components to make a new product, e.g., the manufacture of cars, telecommunications systems hardware, multimedia equipment, industrial machinery, etc.

Some examples are Autoeuropa, Bosch, Nokia, Apple, Samsung, etc.



The "Wholesale" sales model

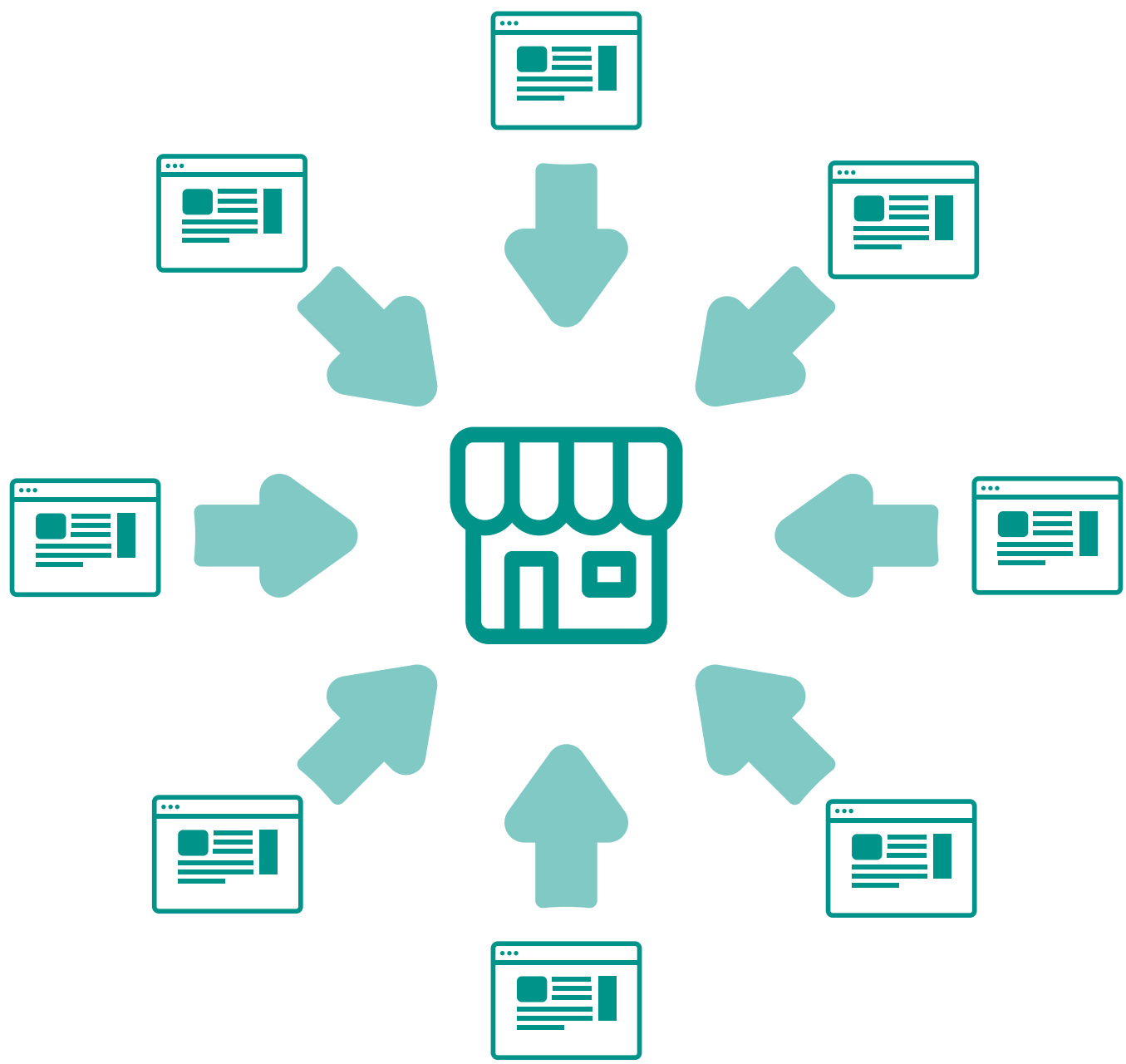
Is practiced by companies that buy goods wholesale from manufacturers and sell them to customers at a price that covers their expenses and generates profit. Companies with this business model can trade in physical shop and also online.

Some examples involve companies like Home Depot, Target and Nordstrom, etc.

The affiliation business model

Typically done through online applications and guarantees profit from the sale of products from third parties and that through a percentage of commission sell the products of a given company.

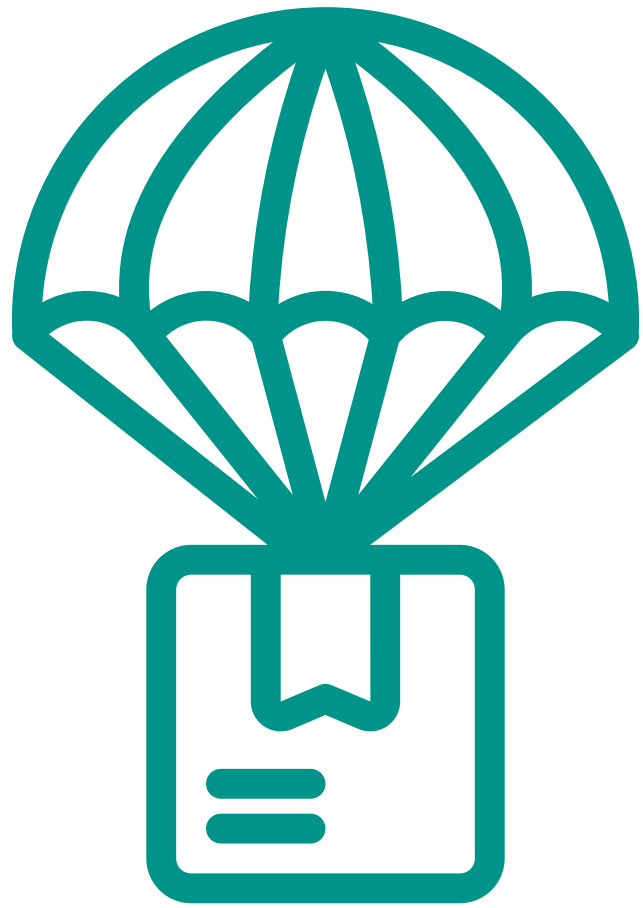
The sites that promote this type of business model promote the products with banners and other means of dissemination to increase the volume of sales and, consequently, the profit.



The Dropshipping model

Buys from the manufacturer or distributor directly and sells to customers, sending the product directly to them, avoiding stockpiling products, avoiding the risk of stock and storage costs. Dropshipping requires less capital, is easier to start with low overheads and the business can be carried out through any location (communicating with suppliers).

Some examples of companies that have dropshipping as their business model are Oddity Mall, Bidet Genius, Shipify.



3.2. Process of choosing the most appropriate business model for the business you intend to set up

With a solid knowledge of the various types of **business models**, it is important to identify the most suitable business model for the business you want to start. In this regard, here are some recommendations (in response to some questions) to identify the most appropriate model for the business to be created:

- **The client**

Customers are the main consideration when selecting an appropriate business model. It is critical to add value to the overall customer experience and their buying patterns by prioritizing their needs and understanding how they buy.

Some questions you should have answers to when deciding on the most appropriate business model for your startup:

• Who are the real customers? Divide them from the rest of the population depending on their psychographics, behavior, geography and demographics;

• What are your customers' buying patterns and behaviors?

• What does your startup aim to achieve and deliver?

• How do your products or services help customers solve their problems?

• What problem do your products or services solve or address?

The answers should help define the qualities and characteristics of the customer you want to attract.

- **The Value Proposition**

A value proposition is a brand's promise to deliver tangible benefits to customers. How the brand will solve a potential customer's problem. e.g., Uber helps people solve taxi booking problems by offering taxis on demand. Google introduces algorithms that allow people to search for almost anything.

In this sense, it is essential to assess whether the business model capitalizes on the value proposition and helps to discover how the customer benefits from the products and services and at the same time how it helps in terms of sales.

- **The market**

The next crucial element is analyzing the market the startup is targeting. Creating a business model around a specific need is essential for long-term success. First, it is essential to verify that the target audience is interested and willing to buy the products or services. On the other hand, it is also possible to see if the initial idea that exists is suitable for the market, or if the product or service is more suitable for a different niche or type of market.

It is important to be very knowledgeable about the competition and the approaches they take to stay in business.

Consider different strategies and techniques that can be implemented to stand out from the competition and attract more customers. Potential customers who are closer to the needs of the products or services should also be considered. Customers let you see the competitive landscape.

- **Scalability**

Scalability refers to a company's ability to handle and manage market needs to increase profit margins and, at the same time, increase sales volume (units sold in a given period).
While it is recommended to implement scalability once the business is turning a profit, the company's vision must be adapted to achieve growth and success with scalability as one of the essential factors when deciding on a business model.

- **Costs**

Costs, both non-monetary and monetary, play a central role in choosing a startup's business model. Assuming that the startup of the company has high operational costs, it is not possible to transfer all these costs to the customer. In this sense, it is essential to consider a strategic approach to overcome this limitation, namely a longer recovery period for these costs, or sharing with investors.

- **Customer Relationship**

Business growth depends on customers. In this sense, it is imperative to consider the following questions:

• How can you acquire customers?

• How do you manage to retain customers?

• How can the business be developed with a loyal customer base?

For a startup, it is necessary to foster long-lasting relationships with customers and, at the same time, ensure transparency for good performance. A customer finds the products or services of a startup and makes purchases, but it is essential that the customer can stay and share satisfaction, with the offer of after-sales services, discounts, subscriptions, etc. being very important.

The business model has to consider the relationship and focus on customers and potential customers to generate business in the company.

- **Final grade**

A business model can change over time, being essential that it can guarantee the business objectives of the startup and its clients (https://www.forbes.com/sites/forbesbusinesscouncil/2021/08/25/a-checklist-for-selecting-the-right-business-model-for-your-startup/?sh=23bf3b1b39a4).

3.3. Tips for developing a business model

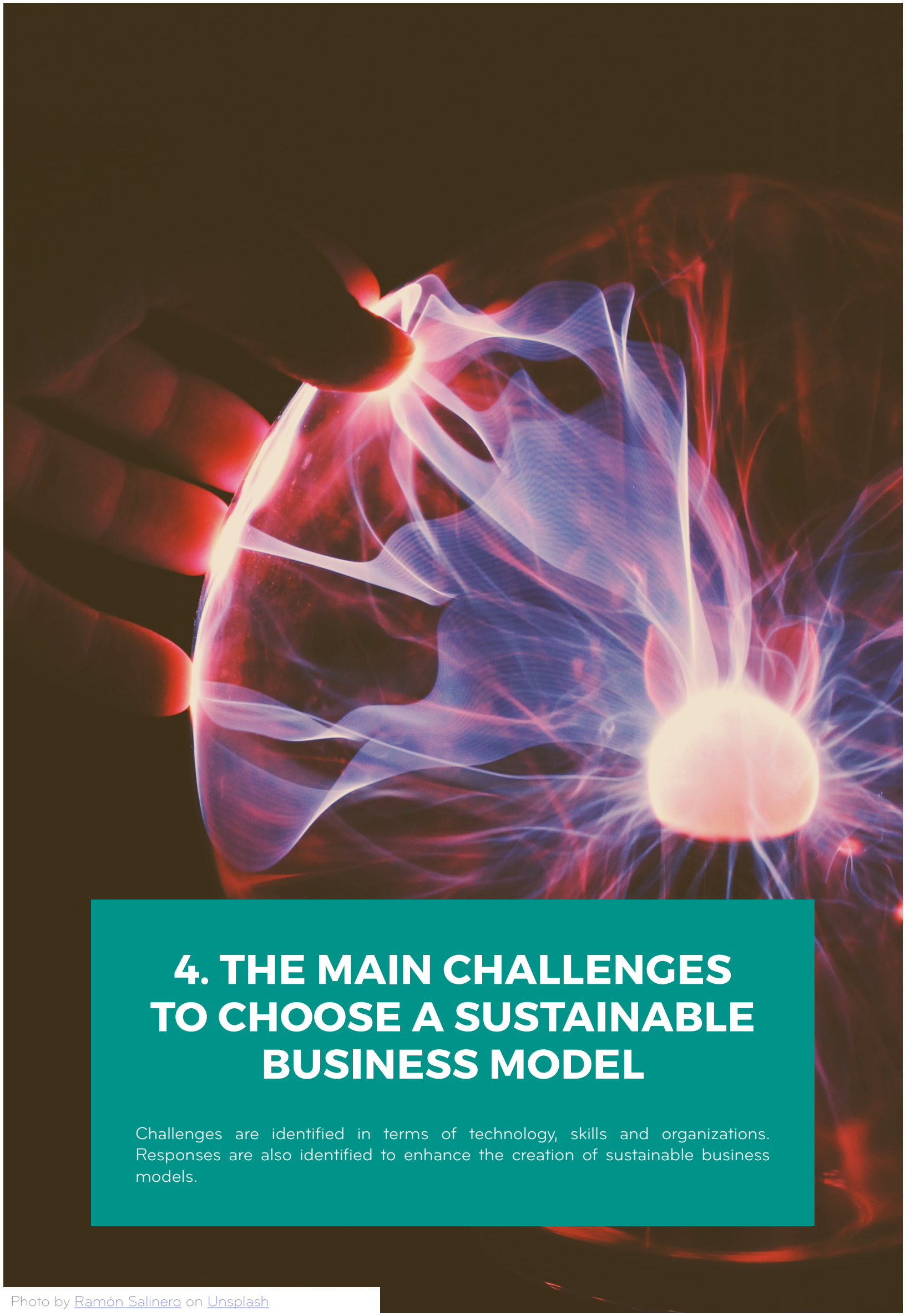
When you want to develop a business model, you should think about some tips for developing it. In this sense, the following are the main tips:

- Thinking and rethinking the business model from the beginning facilitates the analysis and fine-tuning of the goals for the business, the sustainable growth of the business and the profit to be obtained;

- The business model requires a plan for the company's growth, structure, partners, revenues and costs;

- During the course of the business, think again about the business model and the necessary fine-tuning and new approaches for the same product/service or others derived from the initial products/services and that can generate new business models in a sustainable way;

- Consider a sustainable business model in the economic, but also environmental and social plans and whenever possible consider actions to implement circularity, i.e., focusing on the reuse, regeneration and recycling of products or services and, consequently, on extending their useful life.



4. THE MAIN CHALLENGES TO CHOOSE A SUSTAINABLE BUSINESS MODEL

Challenges are identified in terms of technology, skills and organizations. Responses are also identified to enhance the creation of sustainable business models.

Photo by Ramón Salinero on Unsplash

4.1. The challenges of technology

The profusion and advance of technologies is enormous and occurs at a high-speed redefining business model and the way companies are managed, produce and interact with the market, considering aspects related to environmental sustainability and the sustainability of the business itself. In this context, some of these technologies and how they are being adopted by companies are presented (Figure 4.1).

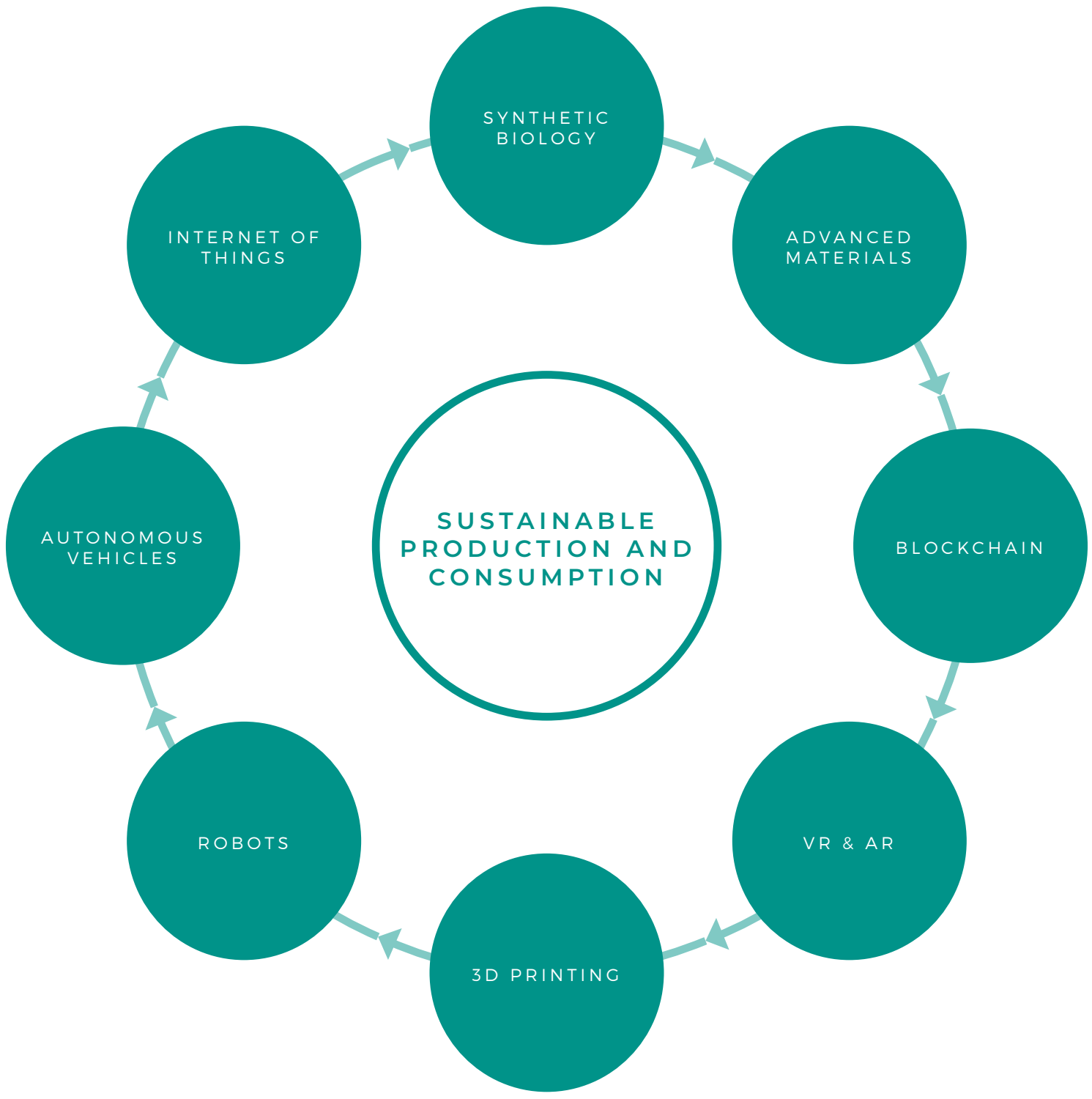


Figure 4.1 – Technologies for sustainable production and consumption. Source: Digital Transformation Scoreboard, 2018, EC, Directorate-General, Internal Market, Industry, Entrepreneurship and SMEs

Artificial Intelligence

Artificial intelligence (AI) is related to the ability of machines to think like humans - to have the power to learn, reason, perceive and decide in a rational and intelligent way. The applications of AI are numerous at the level of companies in their digital transformation process, for example, virtual customer service assistants or chatbots.

Big Data and Analytics

The big data and analytics technologies bring with them the ability, using new tools, architectures, and methodologies, to analyse new types of information such as sensors, audio, and video, for which the traditional information management platforms do not provide answers. New advanced analytical tools are required that automatically identify business behaviors and forecasts, integrating analytical models into the companies' business processes, which now play a central role in the design of business strategies, with a relevant impact on the design of organisations where new functions emerge.

Internet of Things

One of the main technological drivers of sustainable production and consumption is the IoT, which has made interconnected communication between physical entities possible. The Internet of Things (IoT) is the heterogeneous interconnection of physical devices sensors, actuators and intelligent processing units that allow monitoring and predicting trends supporting the decision in an effective and efficient way.

The Industry sector uses IoT to improve efficiency, detect and prevent problems before they occur, and maintain products remotely.

Technology can also be used to enhance the customer experience and build brand loyalty. The main value added by the IoT stems from its ability to define the location, condition and availability of the assets it monitors.

IoT enables automatic and remote monitoring objectives, ensuring resource efficiency during harvesting and production, as well as at the end of its use cycle. Thus, the value of IoT is critical to reducing environmental impact.

Augmented Reality and Virtual Reality

Immersive technologies such as augmented reality (AR) and virtual reality (VR) were first used by retailers to promote their products and services to customers. However, advances in software algorithms and lower costs in AR/VR devices have made immersive technologies deployed in a wide range of applications in recent years. The implementation of AR/VR technology in industry has focused on mentoring and training semi-skilled workers to perform challenging tasks efficiently. In AR, viewers can experience a real-world dominant scene where augmented scenes of computer-generated digital information or virtual things are superimposed on real-world objects. Furthermore, AR technology allows the user to experience human sensory modalities such as vision, tactile sensation and hearing. There are several limitations, but the field of view (FOV) is perhaps the biggest. Today, these devices have an FOV of up to 90 degrees, compared to the 190 degrees horizontal and 120 degrees vertical for normal human vision.

For these devices to create the immersive experiences they intend, they must capture as much of the FOV as possible.

AR/VR devices must show the projected image at a high FOV to the human eye to make the experience more immersive, which requires bulky devices such as headsets. The size of the devices makes their prolonged use unlikely and uncomfortable. As work continues in this area, there are many specifications that need to be met to overcome limitations, namely weight, brightness, display quality, FOV, latency, and ultimately the user experience. The industry will overcome these challenges over the next five to ten years.

Blockchain

Blockchain's biggest challenges are Scalability, Hackers and Covert Trading, Complex to understand and adopt, Privacy and Costs.

- Scalability: The ability to manage a large number of users at the same time is still a challenge for the blockchain industry. Blockchain technology involves multiple complex algorithms to process a single transaction.

- Hackers and Covert Trading**:** The blockchain industry still lacks a set of regulatory oversight, making it a volatile environment and an easy target for market manipulation.

- Complex to understand and adopt: Blockchain technology and the complexities it involves make it difficult for a layperson to understand and comprehend the benefits. It is necessary to understand the principles of cryptography. Another point that hinders blockchain adoption is that financial institutions are suited to provide secure payment gateways and other services at affordable prices compared to the costs incurred with blockchain.

- Privacy: Blockchain technology still has a long way to go to be widely adopted. The privacy engine needs to be revamped in a way that allows restricted access and is only accessible to people authorized to view.

- Costs: Blockchain is usually implemented to eliminate expenses related to third parties and intermediaries involved in the value transfer process. While blockchain technology is quite beneficial, it is still in the early stages of innovation, making systems integration difficult.

Advanced Materials

In general, materials and systems need to be smaller, lighter, stronger, more resistant to the environment and more durable. New materials are needed and new methods or equivalent materials will be needed. At the same time, new or replacement materials will have to comply with increasingly stringent and broad environmental impact constraints. Joining technologies for incongruent materials, e.g., metal with polymer, will have to be developed and validated to understand their behavior in diverse applications. One of the main challenges is to create methods to inspect, evaluate, repair or replace failed components and materials.

The properties of materials such as composites, ceramics, intermetallics, etc., become dictated by the process, or even by scale and geometry (e.g., microelectromechanical systems or MEMS devices, anti-reflective coatings, nanocrystals). As materials typically drive device/system performance and reliability, capabilities that measure critical engineering properties are also needed.

Non-destructive assessment and inspection methods also continue to be important tools to verify that desired results were achieved. Otherwise, it is necessary to quantify which properties are achieved and assess the impact on the overall performance and reliability of advanced materials.

Synthetic Biology

Currently, the development of synthetic biology faces several challenges, from defining the "components" of life to building a complete system. The main challenges of synthetic biology are:

- Lack of description of many biological components
  A biological "component" can be anything, such as the object that can encode a DNA sequence of a specific protein. However, the problem is that the characteristics and functions of many "components" of life have not been clearly described, e.g., what are their functions? Do these behave differently under various laboratory conditions?

  The Standard Biological Component Registration Center at MIT has more than 5,000 biological components for order, but the quality of these components cannot be guaranteed because they do not have enough time to carry out these biological components described in detail.

  Synthetic biologists have pointed out that the complexity makes it difficult to pass the detailed description of these gene components through a standardized method.

- Building biological systems is complicated and unpredictable
  With the growth of the biocircuit, the construction and testing process has also become more difficult. Investigators need to test these generated variant forms, one by one, to find a variant structure that can increase production sufficiently, trying to accomplish the goal of removing these toxic intermediate molecules.

- Biocircuit testing is complicated and time-consuming
  Even if the functions of each biological component are already known, the real functions may not be the ones expected after combining the components. Compared to the more predictable design process of other modern engineering disciplines, synthetic biologists have always been stuck in the tedious process of trial and error. Furthermore, such a process requires a large amount of time while efforts may not be satisfactory.

The large-scale practical application of synthetic biology still takes longer to achieve.

Autonomous Vehicles

The main challenges to develop an autonomous vehicle are to make the vehicle learn by itself and be able to drive by itself. Currently, there are many experiments (prototypes and pilots) that have been developed in a controlled environment (under human supervision and excellent road and environmental conditions), but there are some challenges for the development of fully autonomous vehicles. In this sense, the following challenges are identified (https://www.iiot-world.com/artificial-intelligence-ml/artificial-intelligence/five-challenges-in-designing-a-fully-autonomous-system-for-driverless- cars/):

- Road conditions
  Road conditions can be highly unpredictable and vary by geography. In some In some cases, there are smooth and marked wide roads and in others, the road conditions are very deteriorated – without lane markings. The lanes are not defined, there are potholes, hilly roads and tunnels where the external direction signs are not very clear and likewise.

- Meteorological conditions
- Weather conditions are a highly variable factor that can have a strong impact on vehicle action. Autonomous vehicles need to function in all types of weather conditions.

- Traffic conditions
  Autonomous vehicles have to move in all types of traffic conditions and also with the presence of humans and their emotions. Traffic can be highly moderated and self-regulated, but there are often instances where people may be breaking traffic rules. On the other hand, an object can appear under unexpected conditions and it is necessary to drive under these conditions. All these factors have an impact on traffic.

- Liability for accidents
  Liability for accidents is very important. Who is responsible for accidents caused by autonomous vehicles? The software is the main component that will drive the vehicle and make all the important decisions. The humans being driven are not aware of driving an autonomous vehicle.

- Radar interference
  Autonomous vehicles use lasers and radar for navigation. Lasers are mounted on the roof, while radars are mounted on the vehicle body. The principle of radar works by detecting reflections of radio waves from nearby objects. When on the road, a car continuously emits radio frequency waves, which are reflected by surrounding cars and other objects near the road, the time taken for reflection is measured to calculate the distance between the car and the object. When this technology is used for hundreds of vehicles on the road, will a vehicle be able to distinguish between its own signal (reflected) and the signal (reflected or transmitted) from another vehicle?

Robots and Drones

The main challenges of the robotics industry, according to Science Robotics (https://www.therobotreport.com/10-biggest-challenges-in-robotics/) are as follows:

- New materials, manufacturing methods
  Gears, motors and actuators are fundamental to today's robots. But work is underway on artificial muscles, lightweight robotics and assembly strategies that help develop the next generation of low-power, multifunctional autonomous robots.

- Creation of robots inspired by nature
  Robots inspired by nature are commonplace in robotics labs. The main idea is to create robots that work more like efficient systems found in nature. The use of a battery to combine metabolic conversion, muscle-like actuators, self-healing material, autonomy in any environment, human-like perception and computation and reasoning.
  Materials that combine sensing, actuation, computation and communication must be developed and shared. These advances could lead to robots with features such as body support, weight reduction, impact protection, morphological computation, and mobility.

- Better energy sources
  Robots are usually energy inefficient. Improving battery life is an important issue, especially for drones and mobile robots.

  A lot of work is underway to make a robot's components more energy efficient. It is also important that robots and drones can operate by extracting energy from light, vibrations and mechanical movements.

  Research is also being undertaken to improve battery technology beyond the currently available nickel metal hydride and lithium ion options.

- Robot communication in swarm models
  Robot swarms are tricky because they need to sense not just the environment, but each robot in the swarm. They also need to communicate with the other robots, while acting independently.

  Robot swarms require their communication capability to be built into this feedback loop. Thus, perception-action-communication loops are fundamental to designing swarms of robots.

- Navigation in unmapped environments
  Mapping and navigation techniques will continue to evolve, but future robots need to be able to operate in unmapped and poorly understood environments.

  Some of the improvements that need to be made include:
  - How to learn, forget and associate memories of scenes qualitatively and semantically;
  - How to overcome purely geometric maps to have a semantic understanding of the scene;
  - How to reason about new concepts and their semantic representations and discover new ones objects or classes, in the environment through learning and active interactions.

  Robots need to have significant levels of autonomy, leading to complex self-monitoring, self-reconfiguration and repair, so that there is not a single point of complete failure, but graceful system degradation.

- The AI that can reason
  AI is the "foundation technology for robotics". The key is to combine advanced pattern recognition and model-based reasoning to develop an AI that can reason and make sense. AI that can learn complex tasks on its own with minimal training data is also critical.

- Brain-computer interfaces
  Brain-computer interfaces allow some devices and machines to be controlled by your mind. These interfaces could be very useful for enhancing human skills in the future, but developing the technology for wider adoption is the challenge. Equipment to detect brain signals is expensive and cumbersome, and data processing can be cumbersome.

- Social bots for long-term bonding
  Human beings are generally adept at interpreting social behavior. Robots are not. The three biggest challenges of building social robots are modeling social dynamics, learning social and moral norms, and building a robotic theory of mind. Today's social robots were designed for short interactions, which is not how human relationships work. Social robots must expand from instant commitments to long-term relationships.

- Medical robotics with more autonomy
  From minimally invasive surgery, hospital optimization to emergency response, prosthetics and home care, medical robotics represents one of the fastest growing industries. The challenge is to build reliable systems with greater levels of autonomy. A long-term challenge is to allow a surgeon to oversee a suite of robots that can autonomously perform routine procedural steps and call in surgeons only during critical patient-specific steps. The most significant challenge of automating any clinical task is the ability to anticipate, detect and respond to all possible failure modes.

- Ethic
  Ethical problems are identified under five topics:
  - Sensitive tasks that should require human supervision can be delegated entirely to robots;
  - Humans will no longer take responsibility for failures;
  - Unemployment and disqualification of the workforce;
  - AI can erode human freedom;
  - The use of AI in unethical ways.

Challenges for the 3D printing industry

Currently, the challenges of the 3D printing industry are related to equipment, materials, repeatability and post-processing. It should also be noted that the lack of standards, design guidelines and qualified talent is also a major challenge in this area. In addition, it is important to address issues related to sustainability.

4.2 The Challenges of Skills

Digital skills are an important priority for Europe. The European Parliament and the Council of the European Union reached a provisional political agreement in February 2019 on the first Digital Europe programme, in which €9.2 billion will be invested between 2021-2027 in various digital areas: **high performance computing (HPC), AI, and Cybersecurity, Advanced digital skills** and ensuring the wide use and deployment of digital technologies in the economy and society to strengthen European technological leadership. EUR 700 million will be allocated to ensure that the current and future workforce in EU countries.

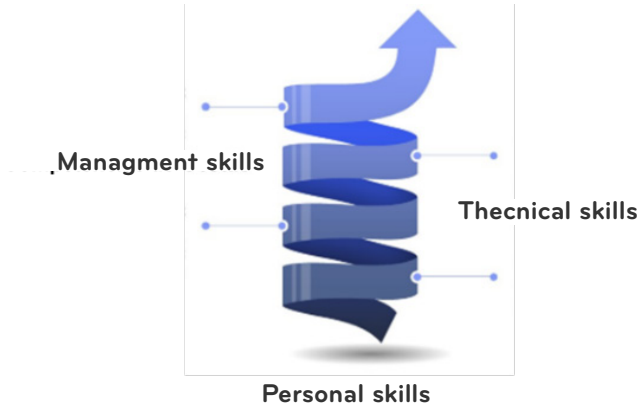


Figure 4.2 – Types of Skills to Enhance Business Models

In order to make workers more skilled, companies have been facing constant challenges and to meet them they need to consider in their business models the development of new managerial, personal and technical skills (Figure 4.2).

Regarding management skills, we can identify team management, knowledge of planning techniques, among others (Figure 4.3).

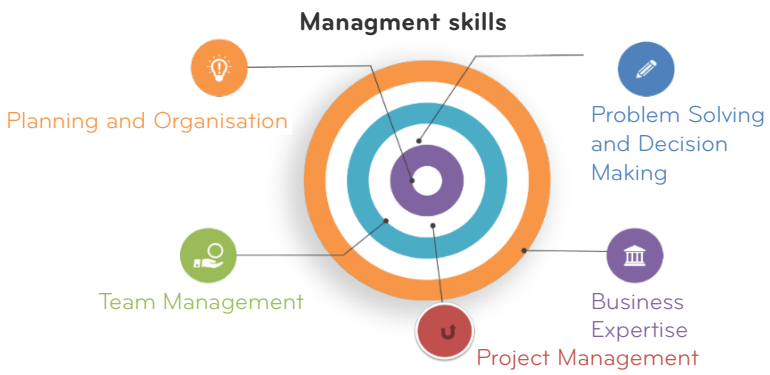


Figure 4.3 – Types of Management Skills to Enhance Business Models

Personal competencies change an individual's performance because they are reflected in the content of their work (Figure 4.4).

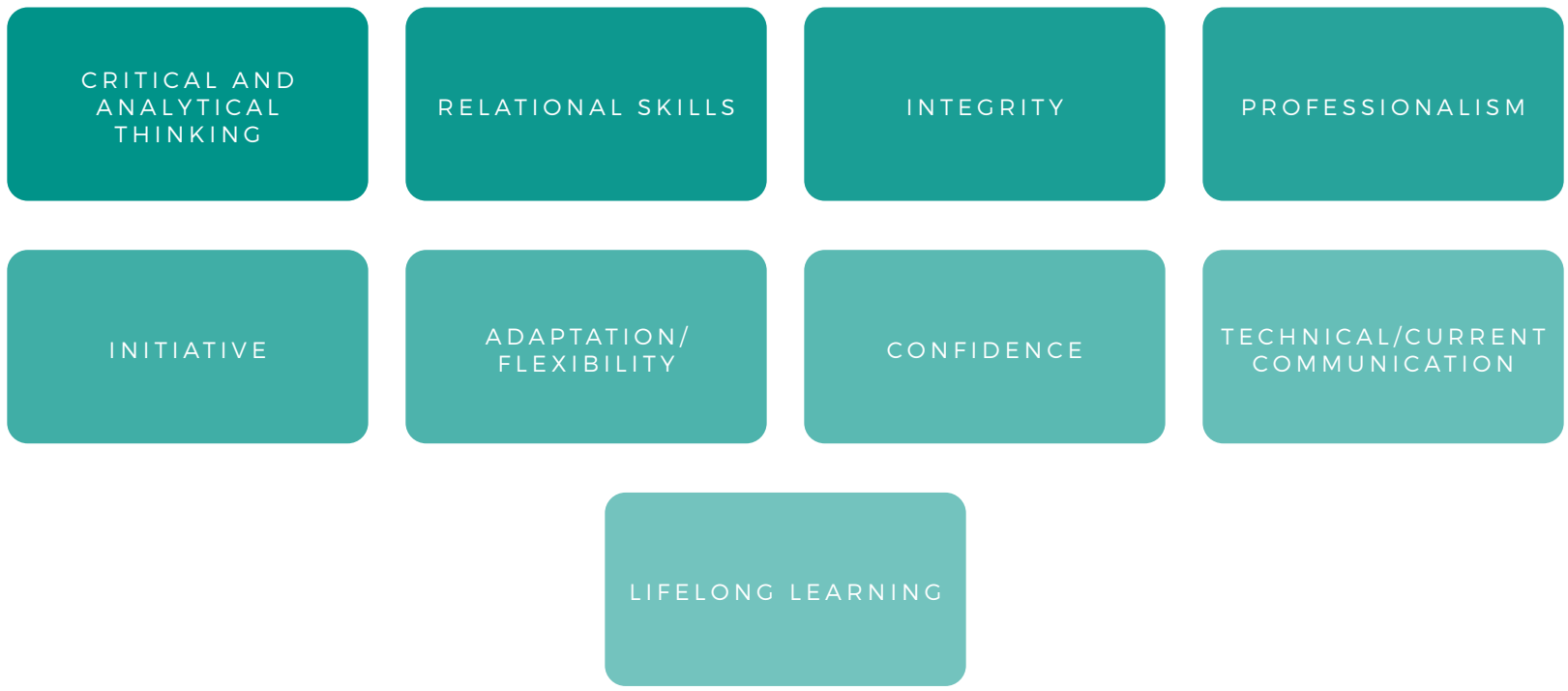


Figure 4.4 – Types of Personal Skills to Enhance Business Models

Relational and emotional skills are the key to a professional's success. However, digitalisation and organisations bring new resources and activities to be performed.

Thus, digital competences will shape the future impacting societies, organisations and citizens. Some of these competences are presented in Figure 4.5.

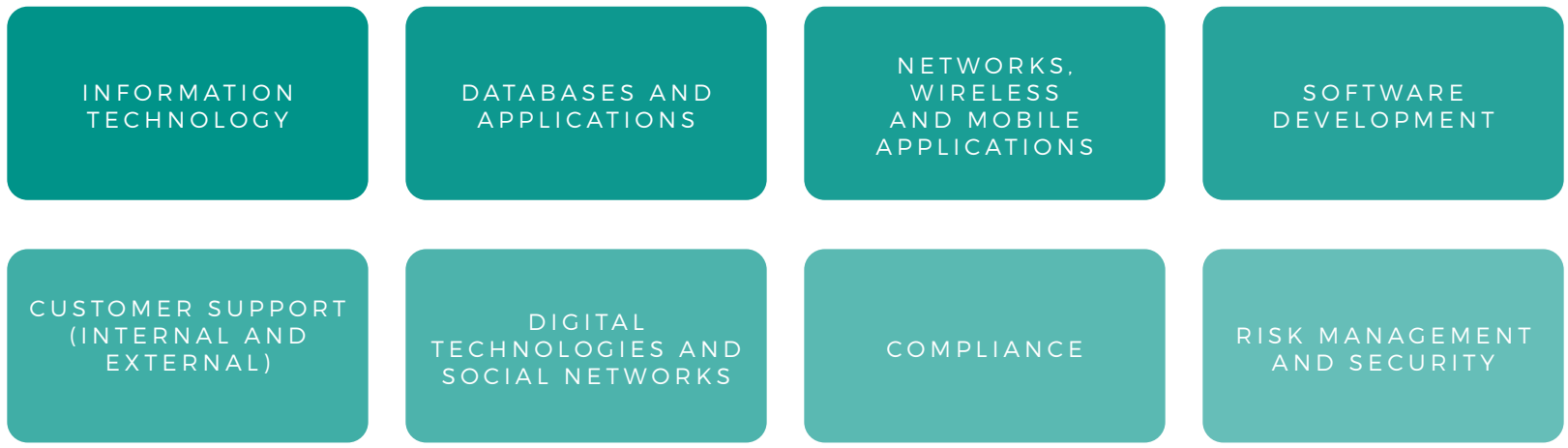


Figura 4.5 – Types of Technical Skills to Enhance Business Models

4.3. The Challenges of Organizations

Organisations present various challenges when defining or redefining their business models, namely in terms of sustainability factors such as:

a. At environmental level

- The replanning of energy use taking into account the minimisation of consumption;
- The redesigning of products and services to minimize the use of materials or recycling of materials;
- Re-planning the use of water so as to minimise consumption and maximise re-use;
- The reduction of waste through recycling or re-using waste or selling it to other organisations;
- The use of renewable energy.

b. At economic and financial level

- Turnover and exports.

c. At the level of the creation of social policies for its workers

- Characteristics of employment and working conditions.

4.4. Responses to enhance the creation of sustainable business models

In order to create Sustainable Business Models, companies may resort to a set of responses that privilege efficiency in the use of natural resources, minimizing waste and keeping resources within the economic chain for a longer time, through the idea of "Reuse, Recovery, Renewal and Recycling" of materials generated by primary raw materials, to later re-enter the economic circuit as secondary raw materials.

As climate change increases the pressure on citizens and companies, changing living habits and business models, the inclusion of environmental issues in the economic debate has also increased considerably. It is also important to value the role of resources and services present in the ecosystem in the operating model of modern economies, which largely involves the use of renewable energies and replacing the end-of-life concept of the linear economy with new circular models for renewing, reusing and repairing resources.

In this context, the EU has a set of proposals to support the introduction of sustainable Business Models, from production, consumption, and waste management processes, reinforcing the importance of reusing plastics, fighting food waste, recovering essential raw materials, managing waste from the construction and demolition sector, the efficient use of biomass and bio-based products, as well as horizontal measures in areas such as eco-innovation and investment.

In Portugal, this strategy is implicit in the Portugal 2030 Programme, which aims at smart, sustainable and inclusive growth, pursuing the Europe 2030 Strategy. In this specific scope, the policies to be developed aim to promote sustainable development, from a perspective of efficiency in the use of resources. It is also intended that the full implementation of these policies leads to the transformation of cities into sustainable and intelligent housing poles, using sustainable materials and the promotion of sustainable mobility.

The Commitment to Green Growth (CGG) is another important strategic element, which aims to foster in Portugal a green economic growth with national impact and international visibility, stimulating green economic activities, promoting efficiency in the use of resources, and contributing to sustainability. To this end, the CCV defines a strategic framework, supported by three key dimensions: growth, efficiency, and sustainability.

5. CASE STUDIES

In order to inspire potential entrepreneurs, six cases of national and international companies with sustainable business models are discussed. Some organizations with sustainability initiatives are also identified.

Photo by Jason Goodman on Unsplash

5.1. National

Three examples of sustainable business in Portugal (e.g., IKEA, Näm Mushroom and Revigrés, in the areas of furniture & decoration, agro-food and ceramics, respectively) are presented in this section.

DO ZERO

Industry Type: Services
Founded company considering the sustainable values

Online store created in November 2020, based on the following pillars that guide the circular economy:

REDUCTION

- By using an electric car to deliver orders in the Lisbon area, they avoid releasing more than 1 ton of CO2
- From day one, all courier deliveries include carbon offsetting, using an electric van
- 50% of products are produced in Portugal and 72% in Europe. The priority is options that are good for the environment and for the customers, which are produced in Europe. Only when this is not possible, do they look for brands and products made in a transparent and responsible way outside Europe
- Collection point for some waste that is difficult to recycle. They receive in the warehouse: Damaged umbrellas, Cork stoppers, Toothbrushes and plastic brush bristles, and Used Cooking Oil

REUSE

They reuse all materials that are properly sanitized and in good condition to use in orders, whether to send the contents of the same, or to fill the bulk of various products that are part of the catalogue. Customers are encouraged (in line with a circular economy and community) to deliver boxes, bags and packages that are in good condition, either through a visit to the warehouse or through the reverse logistics system.

RESPONSIBILITY

They see responsibility as their mission. This responsibility also comes from the fact that the beginning of the project started with Education. Before being a store, it was already a blog, a community on the founding partner's Instagram and a podcast dedicated to sustainability. That

sense of mission has been maintained since the beginning and, now, at Loja Do Zero, the consumption opportunity is used to clarify aspects related to the importance of reducing consumption and, on the other hand, that it is more responsible.

- They guarantee fair salaries and in dignified conditions. The lowest salary is more than 20% above the national minimum wage and the ratio between the lowest and the highest salary is just twice as high (when, in Portugal, the average is about 10 times higher)
- They offer time and work flexibility to the team (whenever the position allows), to manage to streamline their personal life in the best way or even to rest on days when physical or mental health is fragile, e.g., on menstruation days, among others.
- Children and pets are welcome in the warehouse. Whenever the team so desires, they can take their children to work, even to facilitate the breastfeeding of infants and infants. Still, they are encouraged to make full use of parental leave rights.
- They made their first contract through the SEMEAR Academy (https://semear.pt/semear-academia/).
- In addition to contracting within the LGBTQI+ community, they make sure that the communications are neutral and inclusive.
- In 2021, they donated a total amount of €8,547.37 to social and environmental institutions: Ocean Alive (they sponsor a marine prairie), Verde Associação, SEMEAR, Just a Change, AMAL.
- In November 2021, they started a partnership with GoParity to be investors in impact projects, committing to invest €0.21 of each order in projects with social and environmental impact.
- Continuously work with suppliers to improve processes and reduce waste and the carbon footprint of joint operations. This includes asking for packaging changes, so that less material is used and is more easily recyclable, with Portuguese products in its packaging and the creation of packaging return circuits, among others.

Näm Mushroom

Industry Type: Agri-Food
Company created with circular business model

NÃM is a Circular Economy company that reuses coffee grounds to grow mushrooms and generate economic value from them. It always does this with a social concern. What started as a small facility in Lisbon ended up becoming the first urban Circular Economy farm in Portugal. In this Circular Economy farm, coffee grounds are turned into organic mushrooms. In 2019, a partnership was established between the Portuguese multinational Delta Cafés and NÃM, a project that seeks to combine economic viability with ecological sustainability. The mushrooms from the Urban Mushroon Farm can be purchased in Lisbon markets or directly at the urban farm, in Marvila, where NÃM has developed a "do-it-yourself" process that reduces the incubation and fruiting time from, usually, six weeks, to one week. One of the kits of this homemade process allows producing Pleurotus (mushrooms) at home, including the substrate, having only to ensure the humidification process. The other kit makes it possible to produce mushrooms by feeding them coffee grounds.

Revigres

Industry Type: Ceramics
Company adapted to sustainable standards

Revigrés, established in 1977, is a manufacturer of ceramic floor and wall tiles, which has environmental certification according to the normative reference of ISO 14001:2015, defining in its environmental policy the goal of integrating the continuous improvement of environmental performance of its activities, meeting compliance obligations, preventing pollution and protecting the environment. The brand presents several certified collections with Environmental Product Declarations, according to the ISO 14025 Standard (Type III), compatible with the BREEAM and LEED Sustainable Building Certification Systems, which quantify its environmental impact. With a focus on circular design, Revigrés put on the market REVICOMFORT, a removable and reusable ceramic floor, which requires no adhesives, cement, or skilled labor, and can be used immediately after application.

In terms of performance, some of the goals to be achieved are:

- The recovery of 98% of process waste, directly incorporated into production and other manufacturing processes;
- The constant preference for recovery over disposal;
- The option for ECODESIGN: a more efficient production plan and process that allows a reduction in environmental impacts;
- The reuse of all industrial wastewater;
- The management of CO2 emissions and the implementation of measures to reduce them;
- The use of inert raw materials and consequent reduction of hazardous waste;
- The implementation of an energy rationalization plan for processes and equipment;
- The use of fully recycled packaging and treated pallets;
- The production of electricity through photovoltaic panels in order to use clean energy.

5.2. Internationals

Three International sustainable business examples (e.g., Too Good to Go, Signify and UPS, in the Agri-food, energy and logistics and supply areas, respectively) are presented in this section.

Too Good to go

Industry Type: Agri-Food
Country: Denmark
Created with the objective of fighting food waste

Founded in 2015, Too Good To Go saved its first meal in Copenhagen in March 2016. The founders' initial idea was to focus on food that would be wasted at the end of a buffet. When they developed this concept, they quickly realized that this could be extended to all types of food service providers, such as restaurants, cafes, bakeries, and hotels. The logic of Too Good To Go is simple: connect consumers with businesses whose products have not been sold and would be discarded. Currently, its success can be measured as it has expanded from one city to 15 countries. Too Good To Go, arrived in Portugal in October 2019 and today is already part of the daily life of about 10% of the Portuguese. In the application, users find a diverse range of food establishments, which provide their surplus, in the form of Magic Boxes. A concept that translates into a selection of surplus food products (from a particular establishment) that can be purchased through the App for abou 1/3 of its usual value.

Signify

Industry Type: Energy
Country: Netherlands
Created with the goal of fighting food waste

Based on the principle of product as a service, Signify makes a pay-per-lux service available in the market, which allows the consumer to purchase lighting, with the company remaining the owner of the lamps. Thus, when necessary, the company is responsible for repairing or replacing the lamps, ensuring that the service is available. The idea was initially developed by Turntooe and Philips. Today, Signify **leads the way in LED lighting innovation** and is at the forefront of lighting systems and services using the internet of things (IoT). Signify ensures that after recycling, 92% of materials from used lamps are recovered and can be used in the production of new lamps and 81% in the production of luminaires.

Signify's fifth year on the **Dow Jones Sustainability Index** confirms its leadership in sustainability by improving its score on S&P Global's Corporate Sustainability Assessment 2021.

UPS

Industry Type: Logistics and Procurement
Country: United States
Adapted the model for environmental objectives

In 2019, **transportation activities accounted for nearly 30 percent of U.S. greenhouse gas (GHG) emissions**. For a company like UPS, which distributes goods between regions, transportation activities represent the majority of GHG emissions. As a result, increasing transportation efficiency is crucial for organizations like UPS to remain sustainable. As a solution, UPS has adopted an AI system called ORION which is a route optimizer that aims to minimize the number of turns during delivery.

ORION saves UPS approximately 45 millions of litres of fuel per year, which means that in addition to the financial benefits, it decreases UPS's carbon footprint by 100,000 metric tons per year, or the equivalent of removing more than 20,000 cars from the roads.

There are public cloud route optimization systems that companies can deploy without building hardware. These tools help companies use the software as a service by subscribing to a subscription.

5.3. Companies with outstanding sustainability initiatives

This section refers to several companies that have stood out at the level of sustainability initiatives.

Ranked as one of the world's most sustainable corporations (***Corporate Knights Global 100)*** has been a green champion for over two decades, ***Schneider Electric*** offers technology and energy solutions to help companies reduce their carbon footprints. Schneider has accelerated its climate commitments to generate 80% "green revenues" by 2025 and help customers avoid up to 800 million tons of emissions.

Finnish refinery ***Neste*** is a pioneer in solutions for conventional fuels and alternative refining of plastic and other materials. In March, ***Neste*** announced a USD 1 billion investment in a joint venture with US oil company Marathon Petroleum that will make it the world's first and only renewable fuel manufacturer with global capacity.

Danish energy company ***Orsted*** has revolutionized the energy industry to reduce the effects of climate change and is currently the world's largest producer of wind farms. ***Orsted*** has achieved a net zero target.

In the airline industry, ***JetBlue*** is at the forefront of carbon neutrality through offsetting emissions due to investment in forestry, landfill gas capture, solar and wind projects. The airline has aligned itself with UN Sustainable Development Goal (SDG) 13 (Climate Action) and is exploring renewable fuel options for the aviation fleet.

Sports companies, ***Nike*** and ***Adidas*** contribute sustainability strategies in their business models. **Nike** has made efforts to reduce waste and use renewable energy and ***Adidas*** has created a supply chain commitment that, by 2025, nine out of 10 ***Adidas*** items will be made from sustainable materials.

Unilever and ***Nestlé*** have made major commitments; ***Unilever*** is aiming for zero net emissions from its products by 2039 and ***Nestlé*** has committed to achieving zero net greenhouse gas emissions by 2050 and having 100% recyclable or reusable packaging by 2025.

Walmart, ***IKEA*** and ***H&M*** act on supply chains to reduce waste, increase resource productivity and optimize the use of materials. ***Walmart*** has pledged that it will have zero emissions in all vehicles by 2040 and will transition to low-impact refrigerants. ***IKEA*** is on the path to renewable energy across the value chain and ***H&M*** has committed to using 100% recycled or sustainable materials by 2030.

In biopharma, ***Biogen*** and ***Novo Nordisk*** have taken actions for energy efficiency, waste reduction and other green measures. ***Biogen*** has had a strategy to set employee and management compensation to ESG targets and ***Novo Nordisk*** has committed to zero net emissions by 2045.

Pepsi and ***Coca-Cola*** have set ambitious targets for reusable and refillable packaging, as well as improving water replenishment.

At the level of national companies, the following examples are considered (https://www.joana-moreira.com/marcas-portuguesas-sustentaveis/):

Based in Vila Nova de Famalicão, ***Baseville*** is one of the sustainable clothing brands in Portugal. The brand aims to reduce the amount of virgin resources in its products and eliminate microplastics.

The company combines environmental awareness and elegance, having two characteristics that stand out:

- Collections designed for different seasons and years;
- Recycling and resale of old parts, preventing them from becoming trash;
- Use of recycled packaging.

Among the sustainable footwear brands, ***Wayz*** presents products produced ethically and with responsible materials, that is, biodegradable and recycled.

Everything is done locally and nationally, from design to production. In addition, the brand still has a minimum of intermediaries and a flexible cost structure, leading to quality, durable footwear at fair prices.

The brand also contributes to local communities by donating 1% of its sales to the NGO SAOM.

Recently launched a 100% vegan and recycled model called *The Grit*.

Näz is one of the sustainable clothing brands in Portugal that stands out for the variety of products, but also for the fact that they have the "SELL 1 BUY 1" service available, which allows customers to find out how much their used items are worth and exchange them for new ones. .

In the manufacturing process you can adopt different paths, however all are ecological:

- Use of surpluses from Portuguese factories;
- Creation of ecological fabrics from organic or sustainable fibers;
- Creation, together with textile companies, of fabrics and knits with recycled threads.

The eyewear brand ***Cuscuz*** has sunglasses and earrings, both pieces are timeless and genderless.

The most interesting thing is undoubtedly the origin of its materials... everything from furniture, beds, benches and factory waste.

Alma de Alecrim stands out for the versatility of its catalogue. An online store from Aveiro, with the products:

- Disinfectants;
- Backpacks;
- Travel bag;
- Thermos bottle;
- Cups;
- Toys;
- Raincoat;
- Bamboo toothbrush.

Nãm is a project that turns coffee grounds into mushrooms. Natan believes that waste should not exist, and thus created a circular business model with a positive impact.
He created an urban farm in Lisbon where he produces his mushrooms. It works in partnership with Delta. a Nãm collects the coffee grounds, mixes them with straw and mushroom seeds.

Marita Moreno is a brand that has rethought its way of production. It was created in 2011, but only in 2018 did it become an eco-friendly brand. For this, it uses natural and innovative materials in its production, such as:

- Linen;
- Income;
- Wood;
- Cork;
- Piñatex (made from cellulose fibers extracted from pineapple leaves);
- Banana peel fiber boards.

Beebla, a sustainable toy brand. In this brand you will find wooden stamps for woodcuts, wooden and cork puzzles, wooden dolls and many other things.

Everything is produced locally with raw materials that are certified sustainable. In addition, there is always a theme involving the products: the sea, the forest, the countryside or the jungle.

Boutik is a sustainable brand with a surfer vibe. It has several handcrafted products, such as jewelry, accessories, beachwear, books and maps – all from well-known brands.

As for meals, they have burrito sushi, tatakis, desserts, toast and, of course, brunch. So, in addition to being a sustainable brand, it is a visitor space.

EcoX, a brand of sustainable cleaning products. The business model is based on the circular economy:

1. Used cooking oils are collected from households and institutions (such as restaurants, hotels, etc.);
2. The oils are then filtered, purified and made into household cleaning products;
3. Finally, they are sold to the public, including those who supplied the cooking oil;
4. With this logic, it reduces the waste of cooking oils and ensures a positive impact.

GLOSSARY

- **Business model Canvas**

  It is a tool to help understand a business model in a simple and structured way. Using this tool provides knowledge about customers, value propositions, which channels and how a company makes money.

- **CAPEX**

  Capital expenditure represents investments or disbursements in capital goods, which are those used in the production of other items, such as equipment, construction materials, among others.

- **Inovation**

  Is to do something new (a new idea, a new product, service, etc.), or something already known, but in a different way (innovative). Innovation requires creativity and ambition to develop innovative products or services.

- **Triple-layer business model Canvas**

  In addition to the business model with the economic dimension, it considers various forms of value through a second layer (with nine environmental elements following a life cycle approach) and a third layer (with nine social elements following a stakeholder approach).

- **Business model**

  It is how the company creates, delivers and captures value. The model depends on the value proposition and characteristics of the company.

- **Business model Canvas - environmental dimension**

  Tool for business models in the environmental dimension that has nine elements and follows a life cycle approach.

- **Business model Canvas - economic dimension**

  Tool for business models in the economic dimension which has nine elements and follows a financial approach.

- **Business Model Canvas - social dimension**

  Tool for business models in the social dimension that has nine elements and follows a stakeholder approach.

- **Sustainable Development Goals**

  These are the targets to be achieved by 2030. 17 Goals underpinned by 169 targets are the steps identified to ensure a fairer, more dignified, more inclusive, and sustainable world. From poverty and hunger eradication to gender equality and quality health, from clean water and sanitation to decent work and economic growth, from inequality reduction to quality education, from renewable energy to climate action, it reflects the balance between 5 Principles: People, Planet, Peace, Partnerships and Prosperity which are presented as pillars of this global strategy.

- **OPEX**

  Operational expenditure is the operating expenses, which are payments related to the business management activity and sale of products and services. For example, a company may purchase a computer at the beginning (which would be CAPEX) but prefers to pay for it as a service over time, in which case it is an operational cost.

- **Sustainable Business Plan**

  It is a dynamic tool, continuous and subject to updates and aims to plan in detail the opening, expansion, or maintenance of the business, ensuring economic, social, and environmental viability.

- **Value Proposition**

  A value proposal is a statement that identifies clear, measurable, and demonstrable benefits and summarizes the reason why a client should buy a company's product or use its service.

- **Sustainability**

  Sustainability is the ability to meet our needs in the present without compromising the ability of future generations to meet their own needs.

- **Environmental sustainability**

  It is the way in which human beings, use goods and natural resources, to meet needs, without depletion and supply to the next generations.

- **Economic sustainability**

  Integrates the entire network of economic activity that - in an effective manner and without going against good management principles and ethical rigor - generates wealth and, once again, guarantees future economic sustainability.

- **Social Sustainability**

  Social sustainability is based very directly on a permanent concern with people and their living conditions, in vectors such as education, health, safety or leisure. One of its purposes is to promote a fairer society, which allows and defends social inclusion and equitable distribution of goods, to eradicate poverty. In addition, it defends as fundamental the respect for the cultural diversity of local communities, whose citizenship rights should be guaranteed.

- **Types of business models**

  They are the types of business models to implement for the commercialization of the product or service and which means the best success strategy for the company.

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