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**SUSTAINABLE BUSINESS MODEL
INNOVATION**
**Case study of three manufacturing
companies in Lombardy**

Relatore: Marco Brusati

Tesi di Laurea di:
Veronica Pivotto
Matricola n° 0028100

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matricola n° 0028100

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autore della tesi di Laurea dal titolo:

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I. SUMMARY

This thesis investigates the business model innovations that three textile manufacturing enterprises in Lombardy carried out in order to become more sustainable. Indeed, the aim of the research question in this thesis was to analyse *how* and *why* companies undertake sustainable innovations, and study the influence of climate change on business models.

Reaching the Paris Agreement targets and the 17 Sustainable Development Goals of the UN are major objectives to accomplish, especially for businesses, to fight climate change and mitigate its negative effects. Therefore, starting from the three analysed firms, this study helps set the way to sustainably innovate the ways of doing business in order to give a positive contribution to the environment and to society.

The thesis was conducted as qualitative research and it takes the form of a multiple case study analysis, where each firm is studied separately and then the three companies are compared in a cross-analysis, in order to find answers to the research question. Data was collected through semi-structured interviews, direct observation, and online sources.

The multiple case study analysis shows that carrying on sustainable transitions and innovating business models for sustainability is an efficient solution, for the corporate world, to fight climate change. In addition, sustainability has proved to be the means through which these three manufacturing companies reach their short-term goals, the long-term vision to accomplish, while at the same time, it enables firms to contribute positively to the environment. As a consequence of this, when becoming more sustainable, firms obtain benefits and competitive advantages.

II. ABSTRACT

This thesis investigates the business model innovations that three textile manufacturing enterprises in Lombardy carried out in order to become more sustainable. The study analyses *how* and *why* these companies undertook sustainable innovations, and it studies the influence of climate change on the business models. Reaching the Paris Agreement targets and the 17 Sustainable Development Goals of the UN are major objectives to accomplish, especially for businesses. Therefore, this study helps set the way to sustainably innovate the ways of doing business in order to give a positive contribution to the environment and to society.

The thesis evolves in the form of a multiple case study analysis, where each firm is studied separately and then the three companies are compared in a cross-analysis, in order to find answers to the research question. Data was collected through semi-structured interviews, direct observation, and online sources.

The multiple case study analysis shows that carrying on sustainable transitions and innovating business models for sustainability is an efficient solution, for the corporate world, to fight climate change. In addition, sustainability has proved to be the means through which these three manufacturing companies reach their short-term goals, the long-term vision to accomplish, while at the same time, it enables firms to contribute positively to the environment. As a consequence of this, when becoming more sustainable, firms obtain benefits and competitive advantages.

Keywords: *“sustainable business model innovation”, “sustainable transition”, “business model”, “sustainable innovation”, “manufacturing”, “interview”, “case study”.*

III. INTRODUCTION

As the title suggests, this thesis develops the theme of **sustainable business model innovation**. The author chose to study this topic because it unifies her two passions, corporate strategic decisions and sustainability. To have a better understanding of sustainable innovations in the corporate world, three companies in the manufacturing sector in the Lombardy region in Italy were used to exemplify the topic.

Sustainable business model innovation is an important topic to study for two main reasons. Firstly, sustainable business model innovation has the primary goal of **fighting climate change**. By seeing the urgent objectives imposed in the Paris Agreement (United Nations Climate Change, 2023), it is not enough for firms to just undertake sustainable practices, but it is rather necessary to radically innovate the business models in order to reach the Agreement goals. Resources in our planet are limited and climate change is in a stage that, if we do not act immediately, it might become irreversible and cause huge disruption on Earth. As urged by the UN (United Nations, 2023a), immediate actions are needed to fight climate change and its consequences, and to meet the 2030 Agenda for Sustainable Development and its 17 Goals.

Secondly, sustainable business model innovation is important because it can bring **benefits and competitive advantages** to companies. Harvard Business Review (Kramer, M. R., Agarwal, R., & Srinivas, A., 2019) stresses the importance of making businesses work together towards reaching the UN 17 Sustainable Development Goals (SDGs) in order to “avoid an embarrassing failure” in the future. The source (Kramer, M. R., et al., 2019) explicitly states that meeting these Sustainable Development Goals could bring opportunities, in the long run, for businesses for about \$12 trillion dollars.

Despite these incentives, though, companies are not moving in the right direction and with the right pace: to be really committed to the SDGs, firms need to update their priorities, create shared value and innovate their business models (Kramer, M. R., et al., 2019).

This thesis aims at providing a multiple case study of three firms in the textile manufacturing sector in the Lombardy region, in Italy. The thesis in general, and the multiple case study in particular, have the goal to study the transitions to more sustainable business models that the analysed companies want to undertake, what aspects of the business models the enterprises want to innovate, to what extent and how they plan to transform their business models, the reasons behind these changes, the goals at which the firms aim to with the green innovations. In addition, in this thesis, the influence of some sustainability factors on the aspects of the business model of firms is studied.

Literature shows that sustainable business models can be either driven by society, stakeholders, and customers, who all demand companies to be more sustainable, or by climate change pressures. Indeed, the urgency to act immediately to *save the planet* is felt by companies. The latter can, in fact, engage as well in sustainability with the final aim of fighting climate change, reducing the risks linked with it, meeting the 17 SDGs, and keeping the temperature of the Earth within an increase of 1.5°C. Literature also shows that including sustainability in business models brings benefits to companies and puts them in a better competitive position.

However, sustainable business model innovation is still a new and little developed topic (Geissdoerfer, M., Vladimirova, D., & Evans, S., 2018)(Ferlito, R., & Faraci, R., 2022)(Hernández-Chea, R., Jain, A., Bocken, N. M., & Gurtoo, A., 2021), thus much

research is still to be done. Theory highlights **gaps in the literature**: studies and reviews on sustainable business models lack depth and are few in numbers (Geissdoerfer et al., 2018)(Ferlito et al., 2022); there are gaps on how and why companies should take on transitions towards more sustainable business models (Hernández-Chea et al., 2021); studies on how to implement and innovate the business models are not yet detailed enough or show gaps in knowledge (Ferlito et al., 2022).

The **originality** in this thesis comes from the case studies of the three manufacturing companies. Analysing practical cases is helpful not only to prove and apply the concepts stated by the theory, but also to see how firms are *really* implementing sustainable business model innovation in the corporate world. Therefore, as stated in the research question, this thesis contributes to the knowledge gaps by providing examples on how the analysed firms undertake sustainable innovations to their business models, the reasons behind these choices, and the process they plan or planned to carry on in order to implement the sustainable transitions.

The **key takeaway** of this thesis is that innovating the business model or making a transition towards more sustainable business models is fundamental in order to show commitment to the SDGs, be able to directly fight climate change, and generate a positive contribution to the environment. The content of this thesis provides suggestions and exemplifications for managers and their companies, as well as for scholars and researchers, on how to conduct business model innovations for sustainability. The thesis aims at incentivizing innovation in companies, showing that sustainable business model innovation is an effective solution and brings benefits, and describing how the three firms implemented sustainable transitions in the manufacturing sector.

The research design of this thesis is descriptive: indeed, this thesis aims at describing the transition of selected companies to more sustainable business models. The research context of the thesis is the multiple case study of three companies in the manufacturing sector in the Lombardy region in Italy. The source of data comes directly from the companies and indirectly from websites: people that work in the enterprises are interviewed, and websites of the firms are consulted. Data is indeed collected primarily through interviews, but also through direct observation and online sources. Data quality issues are solved: for instance, missing data problems are solved with multiple interviews with the companies; data reliability issues are solved by using only data that comes from the primary source or from reliable sources. During the collection and analysis of data, there have been some challenges: for example, having the right amount of data to describe the sustainable innovations, the availability of the companies to collaborate in the thesis project, the writing and redaction of the case studies, and the interpretation of results.

This thesis is divided into **five sections**, the introduction to the topic with literature gaps and contributions; a first chapter about the relevant literature and what is known to date; a second chapter on the research methods used to write this thesis and to collect and analyse data; a third chapter on the data analysis from the three case studies; and a fourth chapter regarding cross-analysed results, the discussion of the findings and a final conclusion of the thesis.

IV. CHAPTER 1: LITERATURE REVIEW

1.1 Methodology of research

Papers of reference have been retrieved mainly using Google Scholar, plus the other databases that IESEG School of Management and LIUC Cattaneo University give access to: for instance, Ebook Central, Emerald Publishing, ResearchGate, Science Direct, Scopus, Springer, Wiley Online Library.

The research of the suitable papers was conducted using keywords, such as “sustainable business model” “business model innovation” “sustainable business model innovation” “business model transition” “transition to sustainability” “climate change”. Papers were scanned for relevance looking at their title, then abstract, and then through a brief reading.

Only some of the papers were selected: they had to be published, if possible, after 2018 to show the latest contributions, and the journals needed to be listed in: CNRS List of Journals and AJG 2021 Journal List.

1.2 BUSINESS MODEL INNOVATION

The concept of business model innovation

To understand the concept of *sustainable business model innovation* (SBMI) (described later in this chapter), that is the concept on which this thesis evolves, a first definition of what a business model is, needs to be given. On this purpose, Amit, R., and Zott, C. (2012) define **business model** (BM) as “a system of interconnected and interdependent activities that determines the way the company ‘does business’ with its customers, partners and vendors” (p. 37); plus, the authors state that “a business model is a bundle of specific activities — an activity system — conducted to satisfy the

perceived needs of the market, along with the specification of which parties (a company or its partners) conduct which activities, and how these activities are linked to each other” (p. 37).

Getting deeper in the definition, Andreini, D., Bettinelli, C., Foss, N. J., and Mismetti, M. (2022) define **business model innovation** (BMI) as “a set of deliberate acts that managers and entrepreneurs perform over time to change the BM [business model] components and architecture in a consistent and innovative way” (p. 1092). The authors also believe that business model innovations result from “continuous learning processes” (Andreini, D., Bettinelli, C., Foss, N. J., & Mismetti, M., 2022, p. 1105).

Business model innovation is extremely determinant in the success and performance of enterprises, plus the final goal that BMI wants to achieve is to put firms in a more strategic advantageous position (Andreini, D. et al., 2022). In fact, Amit, R., and Zott, C. (2012) suggest to managers to take into account all the additional benefits and possibilities that BMI can bring, instead of only innovating processes or products.

The **central elements** of business model innovation are “value proposition, value creation and value capture” (Ramdani, B., Binsaif, A., & Boukrami, E., 2019, p. 2); innovating the business model is “exploring new ways to define” these three elements (p. 1). However, Andreini, D. et al. (2022) see business model innovation as composed by different categories of **processes**: “generative cognition processes, knowledge-shaping processes, strategizing processes, value creation processes, and evolutionary learning processes” (p. 1090). In addition, business model innovation can also take different forms of **changes**: “modular, architectural, radical, and incremental” (Andreini, D. et al., 2022, p. 1092). From another point of view, Bocken, N. M., and Geradts, T. H. (2020) believe that the innovation of business models has the power to

challenge the model itself and the **parts** that constitute it, the “structures, processes and assets”; plus, BMI is characterised by an “unpredictable and iterative” process (p. 15).

Reasons for business model innovation

Business model innovation (BMI) is useful, and sometimes **essential**, for companies as it helps them survive in changing environments, it increases their performance and gives companies a competitive advantage (Ramdani, B. et al., 2019).

Despite being an activity that requires big amount of both resources and money, business model innovation is **effective** because “it involves interdepartmental and multifunctional teams” instead of being restrained to one single function of a company (Andreini, D. et al., 2022, p. 1101). Besides, business model innovation, by focussing on how firms conduct business, is able to reconcile the costs of innovation and the benefits the innovation brings (Amit, R., & Zott, C., 2012).

Besides, Andreini, D., Bettinelli, C., Foss, N. J., and Mismetti, M. (2022) state that business model innovations often occur because of the desire to “**create value** for organisations and their stakeholders” (p. 1102). Moreover, managers and entrepreneurs often turn to business model innovation because, on the one side, the future value of businesses origins precisely from it, and on the other side, because business model innovation can result in being a “potentially **powerful competitive tool**” (p. 37); plus, innovation at the level of the business model discourage competitors from replicating the innovation, as it is a greater modification compared to product or process innovation¹ (Amit, R., & Zott, C., 2012).

¹ Product and process innovation indeed give competitive advantage to firms, but to a lesser extent than business model innovation (Amit, R., & Zott, C., 2012).

Amit, R., and Zott, C. (2012) propose four different “interlinked **value drivers** of business models” that increase the value creation phase of the BM (p. 40): the first driver is *novelty*, which refers to the extent of innovation included in the business model; the second is *lock-in*, which includes all the activities of the business model that incentivise the participants to “stay and transact” in the BM (p. 40); the third driver is *complementarities*, that indicate the value added given by the interdependencies between the activities of the business model; lastly, *efficiency*, which points out at the interconnections within the business model that are able to reduce costs.

Process on how to innovate the business model

Business model innovation is possible in different ways. On the one side, Ramdani, B., Binsaif, A., and Boukrami, E. (2019) believe that there are **two major approaches**: one, that has a more *evolutionary* style, believes that BMI can be achieved by incrementally changing one or more elements of the business model; the other adopts a more *revolutionary* approach, where BMI can be done by a replacement of the old business model. Besides, Ramdani, B. et al. (2019) in their paper state that innovations in the business model can be possible either by changing *one* single element of the model, or by varying *multiple* elements at the same time, or modifying the *relationships* between the elements. Even when the element altered is only one, this change has impacts on both the other elements of the business model and their interactions (Ramdani, B. et al., 2019). However, Ramdani, B. et al. (2019) discovered that modifying several elements of the business model simultaneously is more profitable for firms, compared to changing only one element.

On the other side, similar to what Ramdani, B. et al. (2019) state (thus to alter the relationship of the BM elements or to vary one or more elements of the business model), Amit, R., and Zott, C. (2012) believe that there are **three ways** to innovate

business models. A first method is to “add novel activities” (p. 39) which regards the *content* of the business model (the activities that needs to be executed), as for instance the vertical integration; the second way is to “link activities in novel ways” (p. 39) which is the *structure* of the BM (the linkage among the activities and their sequence); the last form is to “change one or more parties that perform any of the activities” (p. 39) that is the *governance* of the business model (the people appointed to operate the activities) (Amit, R., & Zott, C., 2012). Indeed, according to the authors (Amit, R., & Zott, C., 2012), the business model is considered to be composed of these **three elements** (content, structure and governance) that are dependent on one another; therefore a modification in these elements leads to business model innovation.

Business model innovation can also be seen as a repeated progress. In fact, the “**continuing business model innovation process**” is a procedure in which several typologies of innovations are continuously “created, introduced, changed and developed”, even after the employment of the business model (Andreini, D. et al., 2022, p. 1100). Moreover, in order to retrieve new ideas to then innovate business models, knowledge processes can be used by “departments, divisions, and teams within an organisation”; this type of process is powerful in giving competitive advantage to firms (Andreini, D. et al., 2022, p. 1101).

In order to partially answer the research question, the author of this thesis chose to cite Ramdani, B. et al. (2019). Indeed, the authors (Ramdani, B. et al., 2019) suggest a **BMI framework** that is useful to show what the major elements are, that can be changed in order to innovate the business model. The framework is composed of “four main areas of innovation” that include about four different elements each (Ramdani, B.

et al., 2019, p. 7). The four main areas are: value proposition (*why?*); operational value (*what?*); financial value (*how?*); human capital (*who?*) (Ramdani, B. et al., 2019).

Ramdani, B. et al. (2019) in their framework envision the types of innovation that can be undertaken working on each of the four areas. Regarding the area of value proposition, the authors (Ramdani, B. et al., 2019) suggest to adjust, modify and change the customer value proposition in order to find unmet needs; it is possible to accomplish this by “examining type of offering, its features, offered benefits, brand and lifetime of the offering” (p. 7). In the operational value area, understanding and studying the roles that companies play in the value chain of the related industry can lead to innovations of the business model; in addition, the authors (Ramdani, B. et al., 2019) state that innovations also come from the creation, the change, the termination or the addition of new processes. In the human capital area, BMI can be achieved by introducing innovations in the governance of firms, as well as changing the skills and competencies that conduct the business activities (Ramdani, B. et al., 2019). Finally, in the area of financial value, innovations in the business model can be achieved by “changing the price-setting mechanism, changing the payer, and changing the price carrier” (Ramdani, B. et al., 2019, p. 12).

As mentioned before, changes in the business model can be of several **types** (Andreini, D. et al., 2022). If modifications are applied to only one part of the business model, then it is a *modular* business model innovation; when altering the associations between components of the business model, it is an *architectural* business model innovation; finally, *radical* and *incremental* business model modifications depend on the new contributions that the innovation can bring to the firm and the sector in which it operates (Andreini, D. et al., 2022).

To conclude, Ramdani, B. et al. (2019) highlight gaps in literature regarding, for instance, from which element of the business model, firms need to start innovating; how it is possible to innovate varying multiple elements; what the steps to achieve a significant innovation are; which interactions among elements need to be changed; which **external factors** stimulate the business model innovation and which elements of the business model the external factors impact.

1.3 CLIMATE CHANGE

Climate change and its urgency

Climate change can be considered one of the **external factors** that drive business model innovations (UK COP26, 2021); therefore, in order to answer the research question of this thesis, knowledge of climate change has to be provided. As defined by the COP26 (UK COP26, 2021), “**climate change** is the greatest risk facing us all” (p. 9). Fawzy, S., Osman, A. I., Doran, J., and Rooney, D. W. (2020) support UK COP26 by concluding their study stating that “the world is in a current state of climate emergency” (p. 2071). Climate change is manifested in the increasing number of extreme events that hit the whole planet; in addition to this, people’s health is worsened by air pollution (UK COP26, 2021). Among the extreme events there are “storms, floods and wildfires” (UK COP26, 2021, p. 9), while examples of risks that climate change imposes are “temperature shifts, precipitation variability, changing seasonal patterns, changes in disease distribution, desertification, ocean-related impacts and soil and coastal degradation” (Fawzy, S., et al., 2020, p. 2071).

Additionally, Fawzy, S., et al. (2020) agree with the United Nations (2023b) that define climate change as the “long-term shifts in temperatures and weather patterns” that can have either natural or human origins. Climate change that derives from natural

causes is for instance determined by the solar cycle; while climate change that comes from human activities is caused by burned fossil fuels (United Nations, 2023b). Indeed, emissions that derive from human activities are proved to be putting an added stress on the natural equilibrium of the Earth's ecosystems, plus, they intensify the natural emissions; therefore "human-induced climate change is a major driving force behind many natural disasters occurring globally" (Fawzy, S., et al., 2020, p. 2071).

Fawzy, S., et al. (2020) in their review, report that "total greenhouse gas emissions in 2018 amounted to 55.3 GtCO₂e", 68.5 million people "were affected by natural disasters in 2018", and extreme events caused losses for \$131.7 billion, in the same year (p. 2070). The authors also add that "global warming is likely to reach 1.5 °C between 2030 and 2052 if the current emission rates persist" (Fawzy, S., et al., 2020, p. 2070). Instead, meeting the target of 1.5°C would only be possible if the emissions of greenhouse gases are "maintained at 25–30 GtCO₂e year⁻¹" by 2030, and thus if emissions are reduced by 45% with respect to 2010; plus, the world should reach the net zero level of emissions by 2050; whereas, it is forecasted that the emissions in 2030 would be "52–58 GtCO₂e year⁻¹" if no conditions are imposed (Fawzy, S., et al., 2020, p. 2073).

Acting together to save the Earth

One of the COP's aims (whose name stands for *Conference of the Parties*) is to unite countries towards a common goal: in this case, fighting climate change (UK COP26, 2021). The pace at which countries are engaging and acting in favour of this cause is not "fast enough" (UK COP26, 2021, p. 9). The overall primary goal of the Paris Agreement (UK COP26, 2021) is indeed to "limit global warming to well below 2 degrees and aim for 1.5 degrees" (p. 9) because "every fraction of a degree of warming

results in the tragedy of many more lives lost and livelihoods damaged” (p. 9); in addition, in the Agreement, countries established their own Nationally Determined Contributions (NDCs)² and so the amount of emissions they are reducing.

Supporting the UK COP26, Fawzy, S., Osman, A. I., Doran, J., and Rooney, D. W. (2020) demonstrate that all negative effects of climate change will have lower impact and risk in the scenario of an increase in global temperature by 1.5°C, compared to an increase of 2.0°C; for instance, in “terrestrial ecosystems” under the scenario of an increase of 2°C, the pace at which animals would die out could be the double or triple the pace under 1.5°C scenario (p. 2071).

COP26 (UK COP26, 2021) had four main objectives among which figured out the need to reach a “net zero [carbon emissions] by midcentury” (p. 12). The Conference stimulated countries to set ambitious NDCs and to transition faster towards the use of renewable energy (UK COP26, 2021). Another key point in the COP26 (UK COP26, 2021) is **collaboration**: countries need to work together, collect resources and financing, in order to adapt and to become more resilient to the “devastating effects” (p. 12) of climate change. Lastly, COP26 (UK COP26, 2021) stressed the importance of good **communication** among “governments, businesses and civil society” (p. 13) that would enable cooperation, and thus to start acting to meet the goals.

As previously mentioned, the pace at which countries are currently working towards reducing emissions is not fast enough; indeed, the actual level of commitment would enable the Earth temperature to rise more than 3 degrees by 2100 (UK COP26, 2021) causing extreme weather events to occur more often. COP26 highlights the importance of translating targets and objectives into real action and commitment (UK COP26, 2021). Nigel Topping (UK COP26, 2021) suggests that the key is to build “**robust short**

² Nationally Determined Contributions are set by countries and updated every 5 years according to the most ambitious target each country plans to reach (UK COP26, 2021).

term plans and longer term strategies” (p. 29) to reduce the emissions by half and reach the Paris Agreement standards. Renewable energy and clean technologies must be favoured, together with sustainable agricultural practices in order to be able to reach the net zero objective (UK COP26, 2021). Plus, to tackle climate change, the Intergovernmental Panel on Climate Change (IPCC) requires industries to reduce, on one side, energy consumption: Mitchell, G. R. (2017) points out that Direct Digital Manufacturing can help achieve this goal; this technology uses smaller volumes of materials and products are of “higher performance” so that energy is saved and emissions are cutted (p. 303). In fact, another requirement of the IPCC is to “improve greenhouse gas emissions through the efficiency of material use, recycling and the re-use of materials and products” (p. 304): Mitchell, G. R. (2017) on this regard, suggests designing products such that reusing and recycling them is facilitated; this is indeed a task of the manufacturing sector. A consequence of these actions is the reduction in waste: Mitchell, G. R. (2017) recommends “forming industrial clusters in which expensive facilities can be shared and the waste of one company can be the input material for others” (p. 305).

Moreover, Elizabeth Wathuti (UK COP26, 2021) urges countries to “**take immediate action**” (p. 17) for the future of the planet and for the generations to come; preserving ecosystems and regenerating nature must be at the core of the targets of countries. Wathuti also states that “**it is the decisions we make today that really matter**. What we say yes to. What we say no to and where we choose to invest our human and financial capital right now and not in years to come” (UK COP26, 2021, p. 17). Finally, Elizabeth Wathuti (UK COP26, 2021) expresses the seriousness of the current environmental situation saying that the more time passes without clear and sudden actions for the climate, the more damages are caused and lives disrupted; from her

words - “while we may all be in the same storm; we are definitely not all in the same boat” (p. 17) - transpires again the stress on countries collaboration.

In the same line as Wathuti, Lord Zac Goldsmith (UK COP26, 2021) thinks about the future of our planet stating that we need to harmonise the world economies with the natural world in order to “deliver a greener, safer and more prosperous future” (p. 17).

Climate change resilience and adaptation needs funding, and developed countries agreed in the COP26 to direct every year \$100 billion to invest in climate related matters helping developing countries (UK COP26, 2021). COP26 (UK COP26, 2021) accentuates the necessity of considering the environment in every financial decision; moreover, the Conference suggests companies to declare openly what risks and opportunities the climate change and the net zero transition bring to them.

Regarding companies, and according to the main idea behind this thesis, COP26 (UK COP26, 2021) states: “**companies**, banks, insurers and investors all have to **adjust their business models** and develop credible plans for the transition to a net zero economy and implement them” (p. 15). Indeed, not only some sectors or some countries need to change to tackle climate change, but the entire economy (UK COP26, 2021). Ambitions must become true actions and collaboration between “governments, business and civil society” (p. 26) is necessary to “transform the ways we power our homes and businesses, grow our food, develop infrastructure and move ourselves and goods around” (UK COP26, 2021, p. 26). In support of the change in the whole economy, Mark Carney (UK COP26, 2021) highlights the necessity of the contribution of the financial sector to make the shift to net zero happen and to reach the Paris Agreement goals. The Glasgow Financial Alliance for Net Zero (GFANZ) indeed has these objectives, and in 2021 it included more than 160 firms with “\$70 trillion of assets committed to net zero by 2050” (UK COP26, 2021, p. 25).

In addition, Dornfeld, D. A., (2012) stresses that because the manufacturing industry “is both material- and energy intensive” (p. 12), pressures on this sector are put in order for it to become more sustainable. The manufacturing sector, in fact, discharges many toxic chemicals, produces a lot of waste, emanates CO₂, and depletes a lot of energy (Dornfeld, D. A., 2012). Indeed, Ritchie H. and Roser M. (2020) reported that the **manufacturing industry**, in 2019 emitted GHG for 6.30 billion t, **ranking third** among all most polluting sectors. Therefore, “green manufacturing is an important part of business” (p. 2), and it is pushed by “regulatory pressure, economic incentives, and competitive advantages” (Dornfeld, D. A., 2012, p. 8).

Besides, the COP26 (UK COP26, 2021) has launched two important “UN High Level Champions’ global campaigns” (p. 35) to encourage people to work together against climate change. One is the Race to Zero (UK COP26, 2021) that aims at gathering the collective support of “businesses, cities, regions and investors” (p. 35) having the goal of transforming the economy into a more resilient, healthier one with zero carbon emissions. More than 2300 businesses (UK COP26, 2021) have already taken part in this mission of zeroing their emissions, counting for “21% of the world’s biggest companies” (p. 36). The other campaign is the Race to Resilience that addresses the same actors as the Race to Zero campaign, but with the aim of making people and vulnerable groups more resilient to risks caused by climate change (UK COP26, 2021).

Impact of climate change on the Earth and on firms

Global warming is causing dangerous effects on the whole planet, therefore if we want to limit the damages, the world has to act immediately and keep the global temperature below 2°C (Henderson, R. M., Reinert, S. A., Dekhtyar, P., & Migdal, A., 2015). In detail, as it is well-known, increasing global temperatures cause rising sea level; Henderson, R. M., Reinert, S. A., Dekhtyar, P., and Migdal, A. (2015) report the

estimation that if lands and cities submerge, between 470 and 760 million people would be affected, as well as a large number of enterprises.

Moreover, climate change is bringing more and unpredictable events that hit cities, people and firms; plus, it is responsible for contributing to reduced “crop yields and famines” in the world (Henderson, R. M. et al., 2015, p. 4). Agriculture and food sectors are directly affected as warmer temperatures disrupt the production of food and cultivation of lands (Henderson, R. M. et al., 2015). In addition to health problems for people caused by higher temperatures, climate change is also impacting ecosystems (Henderson, R. M. et al., 2015); a direct consequence of this is that the 1 billion people that rely on fish production and consumption will be severely affected. Another implication of climate change is the increased likelihood of wars due to political instability: indeed, Henderson, R. M. et al. (2015) report that, for instance, the US military considers climate change as a source of concern for the security of the country.

Besides, it is more and more visible that climate change is directly impacting **firms** and the way of doing business: extreme weather is now affecting the assets of many firms (Ai, L., & Gao, L. S., 2023). Indeed, “climate disasters disrupt corporate operations and influence operating performance, disturb supply chains and negatively affect establishment sales” (Ai, L. et al., 2023, p. 1). Fawzy, S., et al. (2020) state that “food, water, health, ecosystem, human habitat and infrastructure are the most vulnerable sectors” under global warming (p.2071). In addition, according to Henderson, R. M. et al. (2015), the agricultural, infrastructural and construction sectors are the ones most visibly impacted by climate change. In addition, governmental regulations (that aim at reducing the impacts of global warming and at decreasing the emissions) impose limits to firms affecting them as they try to react to the regulations (Henderson, R. M., Reinert, S. A., Dekhtyar, P., & Migdal, A., 2015).

In their study, Ai, L., and Gao, L. S. (2023) demonstrated that the more companies are dispersed geographically (in this study in the US), and the more the industry in which firms operate is diversified, the more climate change affects these businesses; this is because these companies, having branches in multiple locations or industries, are subject to more and different kinds of natural disasters. In addition, the study (Ai, L. et al., 2023) proved that, on the one hand, firm risks are reduced if companies undertake “good environmental performance” (p. 14); on the other hand, firm risks are worsened if investors are aware of climate change implications.

Idiosyncratic risk, as well as “firm total risk and systematic risk” (Ai, L. et al., 2023, p. 8) are affected by extreme and unpredictable weather, also due to the effects of the latter that hit firms differently. Moreover, “environmental materiality is an important factor that determines the impact of climate disasters on firm risk” (p. 10), according to the study of Ai, L., and Gao, L. S. (2023).

To conclude, the effects and risks of climate change are rising in number and intensity, and “there is growing evidence that confirms that current mitigation efforts, as well as future emissions commitments, are not sufficient to achieve the temperature goals set by the Paris agreement”; therefore, other approaches and resolutions are needed to tackle climate change (Fawzy, S., et al., 2020, p. 2073).

Sustainability in businesses

The main reasons for which companies fear becoming greener are linked to the belief that the transition will only bring more costs and put the enterprise in a disadvantageous position with respect to its competitors (Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami, 2011). Indeed, many companies still believe that their competitiveness would be reduced if they become more sustainable: suppliers

might not be reliable when it comes to delivering sustainable products, the firm production would need to change pieces of equipment and machinery, and customers would be unwilling to pay more for greener products (Ram Nidumolu et al., 2011). In addition, since the benefits of becoming sustainable companies do not come immediately, firms feel that the *green* transition only increases their costs and efforts (Ram Nidumolu et al., 2011). As a consequence, for companies, CSR is merely a function of the business and it is not included neither in the value proposition nor in the objectives of the firm (Ram Nidumolu et al., 2011).

Contrasting the belief of the customer's unwillingness to pay increased prices for eco-friendly products, Henderson, R. M., Reinert, S. A., Dekhtyar, P., and Migdal, A. (2015) confirm that younger consumers are now more and more prone to pay more for sustainable products. Plus, companies can reduce costs and get competitive advantages if they are able to adapt to climate change and exploit it to innovate themselves (Henderson, R. M. et al., 2015).

In conclusion, Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) define sustainability as “a mother lode of organizational and technological innovations that yield both bottom-line and top-line returns” (p. 2): sustainability indeed brings benefits to companies, increases their competitive position, reduces costs and raises the revenues. The authors (Ram Nidumolu et al., 2011) state, in fact, that **innovation is the key solution to progress, and sustainability is the way to innovate.**

1.4 SUSTAINABLE BUSINESS MODEL INNOVATION

The concept of sustainable business model innovation

Supporting the main reason behind this thesis, Bocken, N. M., and Geradts, T. H. (2020) believe that “sustainability is certainly not restricted to one function, but has to be carried out by multiple functions, so you leverage each discipline; it is important to look at multiple angles to increase your chances for success” (p. 12); from this, in fact, the importance of undertaking not only sustainable practices, but to **completely innovate the entire business model**. David A. Lubin and Daniel C. Esty (2011) agree with this view and add that, considering sustainability as a megatrend, it “touches every function, every business line, every employee” (p. 85).

Andreini, D. et al. (2022) define **sustainable business model innovation (SBMI)** as “innovative ways that have a significant positive and/or significantly lower negative impact on the environment and/or society because of changes in the way the organisation delivers and captures (economic) value” (p. 1103). Bocken, N. M., and Geradts, T. H. (2020) agree on the definition of Andreini, D. et al. (2022) and, in addition, define sustainable business model innovation also as a way of “innovating the value creation, delivery, and capture mechanisms of firms” (p. 1); plus, the authors believe that the definition “includes a broader notion of value: from mainly economic to also include social and environmental value; and from a customer and shareholder focus to a **multi-stakeholder perspective**, including societal stakeholders” (p. 1).

Sustainable transitions of business models and sustainable business model innovation are extreme opposite nuances of the same concept (Aagaard, A., Lüdeke-Freund, F., & Wells, P., 2021). Aagaard, A., Lüdeke-Freund, F., and Wells, P. (2021) define **sustainability transitions**, as “fundamental changes in socio-technical systems to address grand challenges in a way that meets the needs of the present

without compromising the ability of future generations to meet their own needs”³ (p. 4). Aagaard, A., et al, (2021) also state that “sustainability transitions are characterised by **fundamental changes** in the man-made systems of production and consumption, an orientation towards grand sustainability challenges, and radical innovations and the emergence of struggles within existing paradigms and system characteristics” (p. 4); indeed, among these changes, business models are present. Besides, Laukkanen, M., Manninen, K., Huiskonen, J., and Kinnunen, N. (2021) define sustainability transition as “a process through which established sociotechnical systems shift to more sustainable modes of production and consumption” (p. 90). Beers, P. J., Baeten, M., Bouwmans, E., van Helvoirt, B., Wesselink, J., and Zanders, R. (2021) add that sustainability transitions are given by sustainable “new” business models and “societal transitions” (p. 35). In addition, Laukkanen, M., Manninen, K., Huiskonen, J., & Kinnunen, N. (2021) stress that “companies can act as important agents in sustainability transitions if they successfully implement ambitious sustainability strategies through new sustainable business models” (p. 89)

Differently, Bocken, N. M., and Geradts, T. H. (2020) focus their study not on sustainable business model innovation in general, but specifically on the **dynamic capabilities** that are part of the SBMI. These capabilities (sensing, seizing and transforming) are indeed defined by the authors as “an organisation’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments”⁴ (Bocken, N. M., & Geradts, T. H., 2020, p. 2). The authors (Bocken, N. M., & Geradts, T. H., 2020) state that “*sensing* involves companies becoming aware of emerging sustainability issues and understanding and appraising

³ The authors cite Markard et al., 2020 (p. 1). Markard, J., Geels, F. W., & Raven, R. (2020). Challenges in the acceleration of sustainability transitions. *Environmental Research Letters*, 15(8), 81001.

⁴ The authors cite Teece et al., 1997 (p. 516). Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. *Strateg. Manag. J.* 18 (7), 509–533.

these as potential business opportunities”; “*seizing* is about mobilizing resources to address emerging (sustainability) opportunities and capture value from doing so, by translating these into SBMI opportunities”; “*transforming* is about the deliberate continued renewal of the organization's capabilities towards becoming a sustainable business and is about implementing new sustainable business model concepts” (p. 3). The author of this thesis chose to mention this topic because dynamic capabilities are used by firms to innovate their business models; there exist some barriers and some drivers⁵ to these abilities that therefore either hinder or foster sustainable business model innovation (Bocken, N. M., & Geradts, T. H., 2020). The strength and tenacity of the dynamic capabilities of enterprises are given by the organisational design, which is composed by the “strategy, structure, processes, incentives, and people” (Bocken, N. M., & Geradts, T. H., 2020, p. 2).

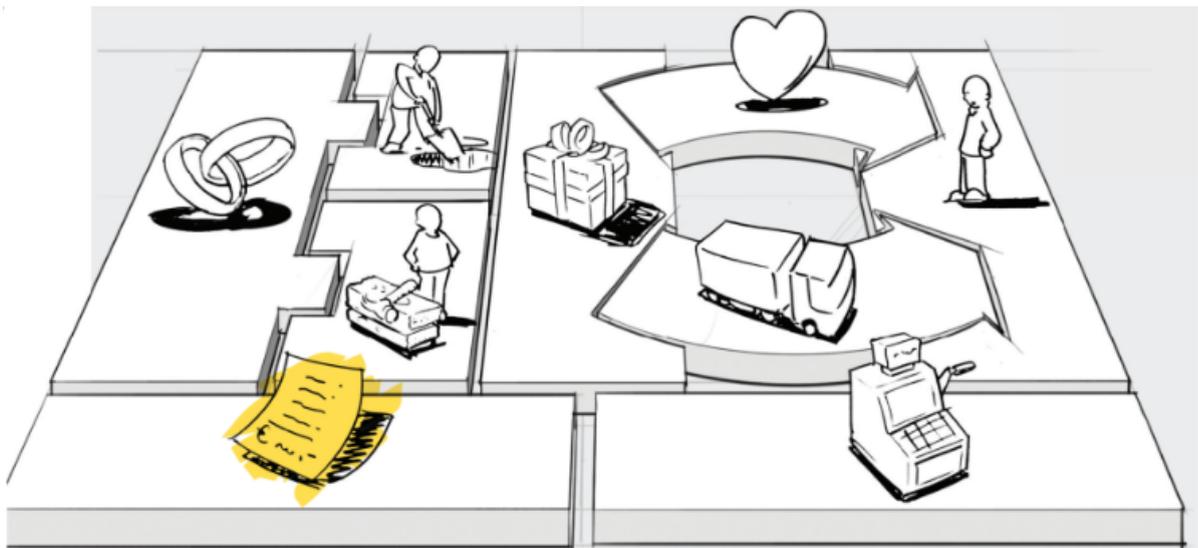
Instead, Aagaard, A., Lüdeke-Freund, F., and Wells, P. (2021), in the introduction to their book, explain that ways of doing business have an impact on “how the environment and other living species are treated” (p. 5). Therefore, the authors (Aagaard, A., et al., 2021) believe that sustainable business model innovation has the power of inspiring companies to find new and sustainable ways of conducting business, with the final goal of giving a positive contribution to the “natural and social systems surrounding” the companies themselves (p. 6). Additionally, SBMs are used as a tool that helps to solve “ecological and social problems” (Laukkanen, M., et al., 2021, p. 90).

Structure of a sustainable business model

⁵ Explained better later in the sub-chapter.

Some researchers preferred to represent the business model in the shape of a canvas, to better give the idea of the various parts that constitute it. The canvas has a structure that originates from the framework of the **Business Model Canvas** by Osterwalder and Pigneur; this Canvas indeed shows how “a company makes business, in nine structured elements” (Cardeal, G., Höse, K., Ribeiro, I., & Götze, U., 2020, p. 2). These elements are: customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, cost structure, key partners (Osterwalder, A., & Pigneur, Y., 2010). **Figure 1.4.1** shows the 9 building blocks of the Business Model Canvas, according to Osterwalder, A., and Pigneur, Y. (2010).

Figure 1.4.1. *The Business Model Canvas*



(Osterwalder, A., & Pigneur, Y., 2010, p. 40)

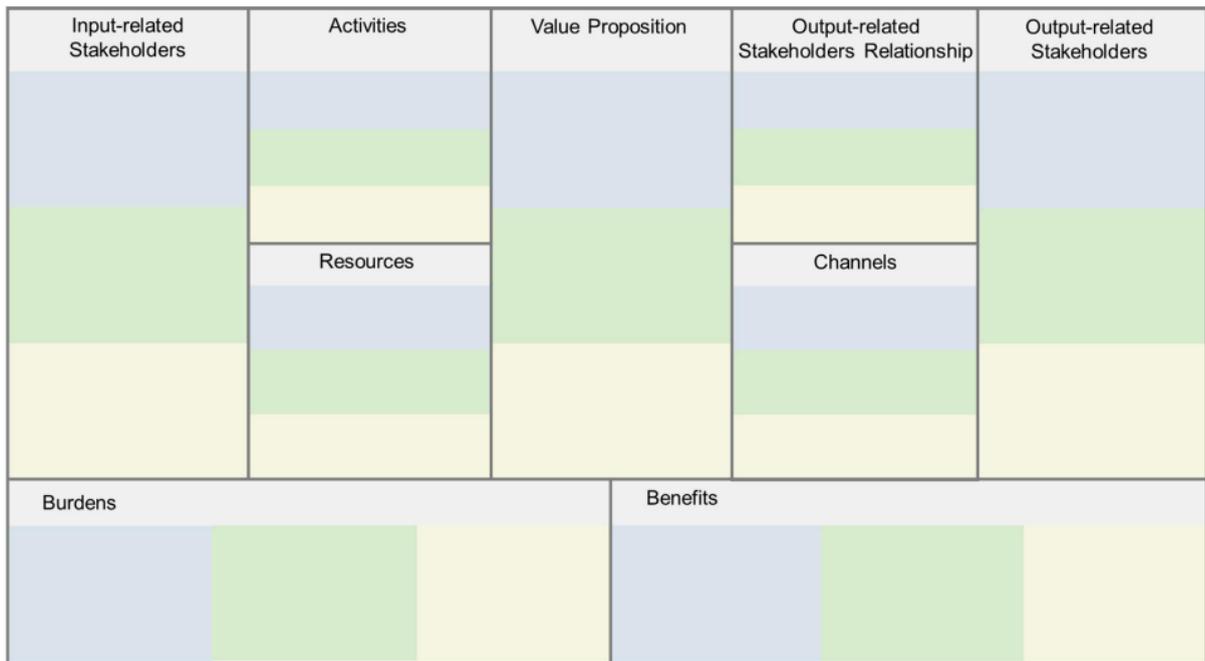
From this canvas, several other canvases were ideated to include sustainability, because researchers complain that Osterwalder and Pigneur’s canvas does not include the social and environmental elements of the BM (Cardeal, G., et al., 2020)(Beers, P. J., Baeten, M., Bouwmans, E., van Helvoirt, B., Wesselink, J., & Zanders, R., 2021). In

fact, sustainability, in business model innovation, is seen as composed of “social, environmental, and economic” pillars (Cardeal, G., et al., 2020, p. 1) (Laukkanen, M., et al., 2021). Indeed, “a change in a business model often affects the social, environmental, and economic performance of the company” (Cardeal, G., et al., 2020, p. 2). Additionally, Beers, P. J., Baeten, M., Bouwmans, E., van Helvoirt, B., Wesselink, J., and Zanders, R. (2021) point out that Osterwalder and Pigneur’s Business Model Canvas does not take neither “negative externalities” nor “positive externalities” into consideration, but only considers value as being “something positive” (p. 31).

In order to give examples of other canvases that take sustainability into consideration, the author of this thesis decided to cite some of these considered interesting in her opinion.

Cardeal, G., Höse, K., Ribeiro, I., and Götze, U. (2020) ideated their own canvas, the **Business Model Canvas for Sustainability (BMCS)**, that has the aim to inglobate the three elements of sustainability in the Business Model Canvas, without adding new voices. Indeed, each element is sub-divided into three parts signifying the three aspects of sustainability (as it can be seen in [Figure 1.4.2](#)); this feature enables companies to consider the social, the environmental and the economic aspect when making business decisions (Cardeal, G., et al., 2020). The blue colour describes the economic part of each element, the green colour is used for the “environmental impact assessment”, and finally the yellow colour stands for the social aspect of the business model (Cardeal, G., et al., 2020, p. 11).

[Figure 1.4.2](#). *Business Model Canvas for Sustainability (BMCS)*



(Cardeal, G., et al., 2020, p. 5)

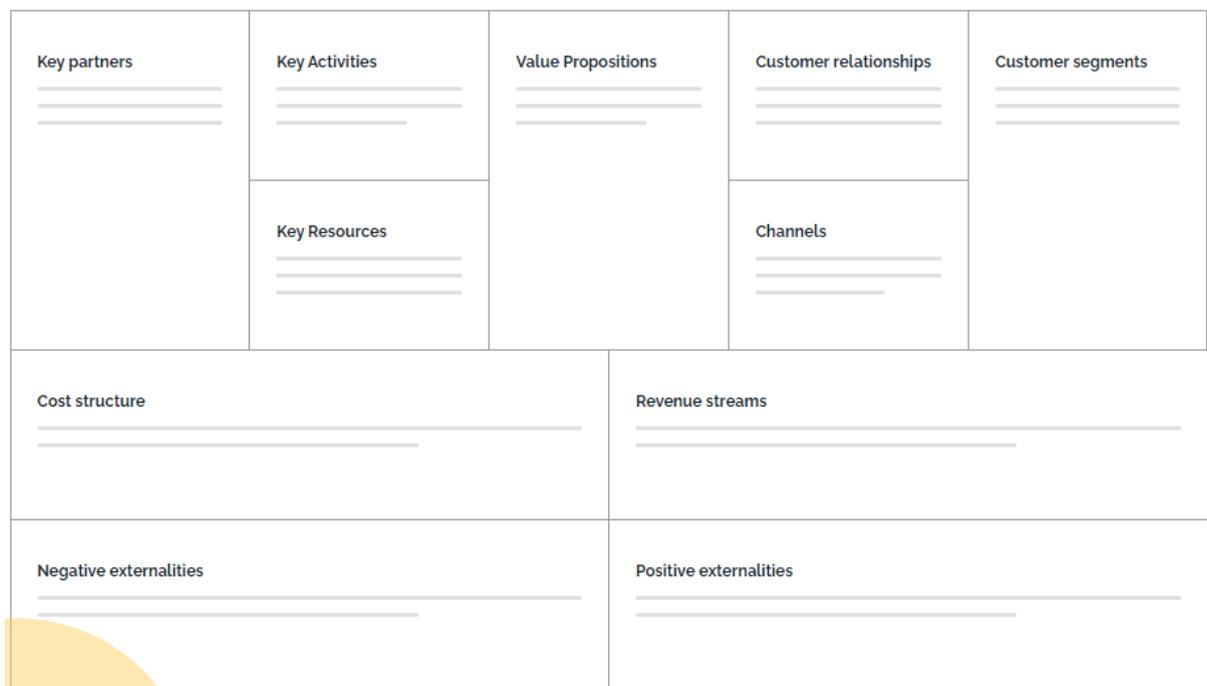
Cardeal, G., Höse, K., Ribeiro, I., and Götze, U. (2020), in their study, explain that for the evaluation and the development of new sustainable business models, two more steps need to be added to the initial filling of the Business Model Canvas for Sustainability. After having identified new ideas for the business model, companies need firstly to evaluate these ideas and compare them with the current (traditional) business model; secondly, enterprises need to evaluate the business model alternatives with sustainable, social and economic assessments (Cardeal, G., et al., 2020).

Furthermore, a captivating sustainable business model canvas is the one designed by Loïc Bar⁶ on the website *Sustainable Business Canvas* (Sustainable Business Canvas, 2020). The structure of this canvas includes the following elements: key partners, key activities, key resources, value proposition, customer relationship,

⁶ Loïc Bar is an impact entrepreneur and founder of Opinum and Coophub EU (Sustainable Business Canvas, 2020).

channels, customer segments, cost structure, revenue streams, negative externalities, positive externalities (Sustainable Business Canvas, 2020). The innovation in this canvas is given by the two added sections that refer to the negative and positive externalities; negative externalities represent the “negative impact of the business”, while positive externalities “create adhesion from customers, employees and shareholders” (Sustainable Business Canvas, 2020). **Figure 1.4.3** reports Bar’s Sustainable Business Canvas.

Figure 1.4.3. *Loïc Bar’s Sustainable Business Canvas.*

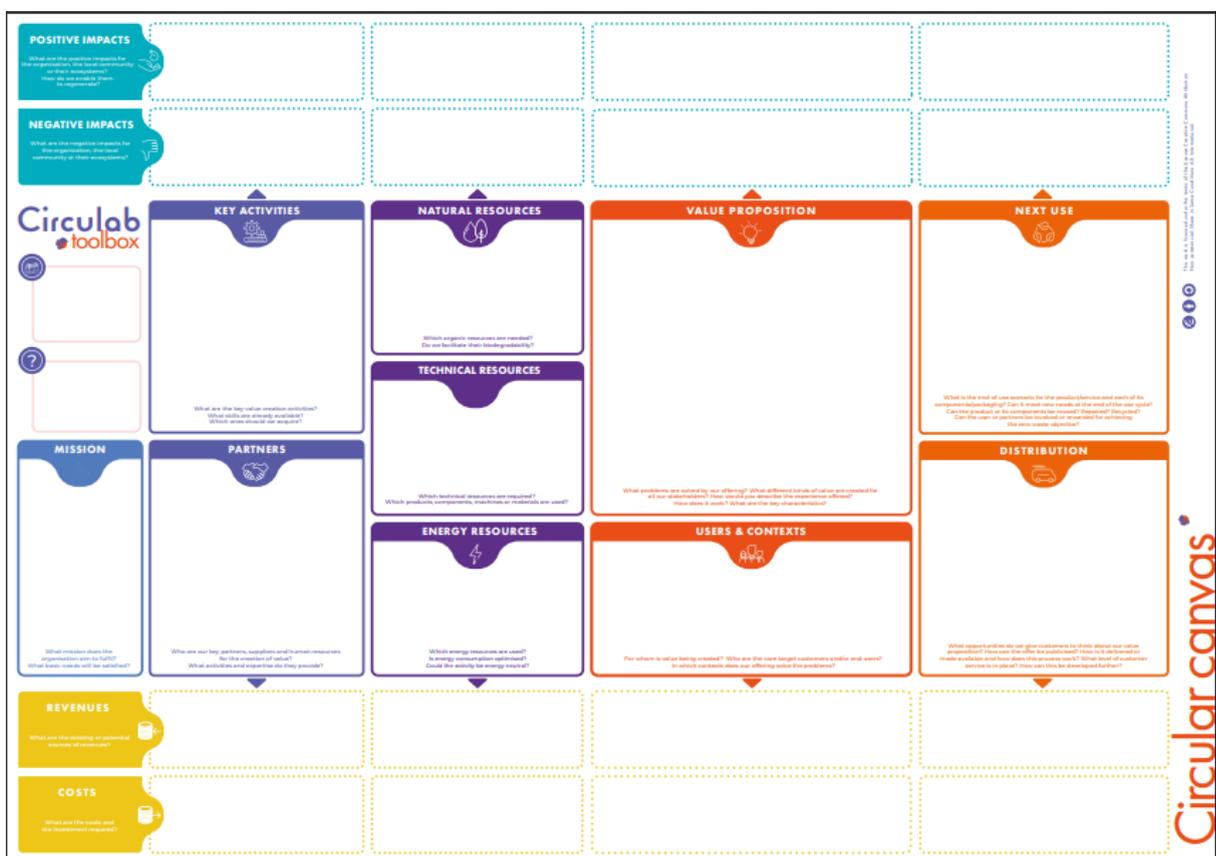


(Sustainable Business Canvas, 2020)

Besides, Circulab developed their own circular business model canvas that, in their opinion, helps companies to “embrace systems thinking and find a balance between economic viability, the ecosystem and sustainability” (Circulab Academy, 2023). The innovation in the canvas is the two design choices between “economic impacts”, which are costs and revenues, and “ecosystemic impacts”, which are both negative and

positive (Circulab Academy, 2023). This canvas is particularly useful to “identify and anticipate the impacts of a business model, product or activity”, to create new and circular “products, services and activities”, and to be aware of how the company captures and delivers value (Circulab Academy, 2023). Figure 1.4.4 shows the Circular Canvas.

Figure 1.4.4. The Circular Canvas.



(Circulab Academy, 2023)

Moreover, Daou, A., Mallat, C., Chammas, G., Cerantola, N., Kayed, S., and Saliba, N. A. (2020) have developed the idea of the Ecocanvas, a business model canvas that is sustainable and specifically designed for circular economies. The authors took inspiration from the idea of the business model canvas of Osterwalder and Pigneur

(2010) and expanded it with three more blocks that take the “economic and legal, environmental, and social forces” into consideration (Daou, A., Mallat, C., Chammas, G., Cerantola, N., Kayed, S., & Saliba, N. A., 2020, p. 3). The Ecocanvas, as described by the authors, enables companies to transition to “a more responsible economic development” (Daou, A., et al., 2020, p. 4). The elements of the Ecocanvas are: need/problem/challenge; customer segments; key resources; circular value chain; environmental foresight and impact; structure cost; social foresight and impact; stakeholders relationships; communication and sales; unique circular value proposition; revenue streams; circular business model and innovation (Daou, A., et al., 2020). The Ecocanvas is shown in **Figure 1.4.5**.

Figure 1.4.5. Ecocanvas: circular business design.



(Daou, A., et al., 2020, p. 5)

Reasons for sustainable business model innovation

This following section tries to answer one part of the research question of this thesis: why companies decide to transition or innovate their business models for sustainability.

Getting back to the urgency claimed by the COP26 (UK COP26, 2021), Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) state that “there’s no alternative to sustainable development” (p. 1). Indeed, sustainable business model innovation is necessary to solve challenges imposed by climate change (Bocken, N. M., & Geradts, T. H., 2020).

Nowadays companies want to satisfy the expectations of stakeholders, and therefore carry on sustainable practices in ESG matters; sustainability is brought into strategic decisions, in the firm organisation, structure and activities (Ioannou, I., & Serafeim, G., 2019). In fact, companies feel the pressure of “suppliers, customers, alliance partners, and the public” (p. 9), but also of “governments, global organisations, and activist investors” (p. 11) to take on practices that are more and more sustainable (Ioannou, I., & Serafeim, G., 2019). Daou, A., et al. (2020) agree with this view: indeed, the authors state that these days consumers demand firms to undertake more responsible and sustainable actions, therefore urging towards more sustainable business models. However, Ioannou, I., and Serafeim, G. (2019) explain that despite sustainability having become “a common practice, a necessary cost of doing business”, they also state that “it remains insufficient for strategic differentiation” (p. 4).

In line with the thoughts of Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011), who believe that sustainability applied to business brings benefits, there are the examples provided by Henderson, R. M., Reinert, S. A., Dekhtyar, P., and Migdal, A. (2015) in their paper: the authors mention, for instance, that in 2018 “25% of Wal-Mart operations were powered by renewables, and the company claims that from 2005 to 2016 its stores reduced energy use by 20% for a total savings of \$1 billion” (p. 10).

Also Bocken, N. M., and Geradts, T. H. (2020) believe in the positive aspects deriving from sustainability by stating that managers are becoming more and more aware of the benefits that companies could get by tackling sustainability challenges: from saving costs and getting “new revenue streams”, through “being ahead of future stakeholder concerns and legislations”, to a better resilience of the company, an increased reputation and a greater attractiveness of employees (p. 1).

Another reason that leads companies to include sustainability in their practices is the **imitation** factor: Ioannou, I., and Serafeim, G. (2019) define imitation as “the outcome of a process through which companies seek to acquire legitimacy by conforming to regulative, normative, and cultural-cognitive pressures” (p. 10). Indeed, firms tend to imitate successful peers when the former believe that the introduction of sustainability activities in those peer companies improves the latter’s performance (Ioannou, I., & Serafeim, G., 2019). Bocken, N. M., and Geradts, T. H. (2020) agree with this view by stating that imitation derives from the unwillingness of firms to put a lot of effort, and especially money, into innovations for sustainability, therefore these companies find it easier to imitate peers.

Plus, imitation also occurs when firms believe that successful peers have more information and hence the former trust their peers' sustainable decisions (Ioannou, I., & Serafeim, G., 2019). If leading companies in one industry are becoming sustainable and, at the same time, they receive the support and the encouragement from media coverage, then the other companies in that industry have the tendency to replicate sustainable actions as, again, the latter are perceived as improving the companies' performance (Ioannou, I., & Serafeim, G., 2019). However, when leading companies introduce “a high degree of novelty” in their sustainable practices, the other companies in the industry find it more challenging to imitate those actions; plus, imitation is

stronger when regulatory measures have a substantial degree of uncertainty (Ioannou, I., & Serafeim, G., 2019, p. 23). Ioannou, I., and Serafeim, G. (2019) also discovered that both low attention and “positive stakeholder feedback” (p. 18) are linked with imitation, while negative assessment from stakeholders incentivises companies to differentiate. Additionally, companies, belonging to the same industry, that see “environmental and social issues” as material have a higher tendency to act alike (Ioannou, I., & Serafeim, G., 2019, p. 21).

In conclusion to their study, Ioannou, I., and Serafeim, G. (2019) state that original sustainable practices really do offer benefits to companies, while merely copying the actions does not necessarily lead to increased performance. Indeed, it is more and more visible during the last years how companies in their industries are imitating the leading firms in undertaking sustainable practices; however, some of these leading companies are able to carry on unique sustainable operations, which maintain them in their outstanding position and in competitive advantage (Ioannou, I., & Serafeim, G., 2019).

Process on how to transition towards a (more) sustainable business model

In order to answer the research question, this section tries to explain what literature says about how to transition towards sustainable business models.

Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) suggest **5 steps** that firms go through when they undertake the transition towards sustainability. The first step is called “viewing compliance as opportunity” (Ram Nidumolu et al., 2011, p. 4), in this phase, the authors explain that companies should try to comply with legal standards and voluntary codes before their enforcement, this way these firms will be able to innovate, gaining the advantages of first-movers and saving costs. The second

stage is called “making value chains sustainable” (Ram Nidumolu et al., 2011, p. 7) which regards the fact of transforming with sustainability the entire value and supply chain of firms to become more efficient, with the causal effects of reducing costs and waste. The third step is called “designing sustainable products and services” (Ram Nidumolu et al., 2011, p. 12), the authors describe that companies, when designing their products, can gain advantages over their competitors if they include sustainability in their projects; this is because customers are more and more willing to purchase eco-friendly products, thus, firms that are able to satisfy needs and concerns of clients, gain competitive advantages. The fourth stage is called “developing **new business models**” (Ram Nidumolu et al., 2011, p. 15), the authors state that it is not sufficient for firms to modify the customer value proposition and to find new ways to deliver value, but it is also necessary to adopt new approaches on how to capture revenues, and to partner up with other companies to co-deliver services. In addition, Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) believe that “developing a **new business model** requires exploring alternatives to current ways of doing business as well as understanding how companies can meet customers’ needs differently. Executives must learn to question existing models and to act entrepreneurially to develop new delivery mechanisms” (p. 18,19). The last stage is called “creating next-practice platforms” (Ram Nidumolu et al., 2011, p. 19), in this stage companies start questioning their current methods, ending up with innovations that enable them to create new ideas of approaches and practices; sustainability indeed is considered an innovation capable of producing “interesting next-practice platforms” (p. 19).

Moreover, Ram Nidumolu et al. (2011) explain that there are two types of **initiatives** that support the sustainable transition for enterprises: the first one relates to the fact that the top management of firms has the power of influencing and leading change in

the company; the second highlights the importance of “recruiting and retaining the right kind of people” (p. 20), people that enjoy their workplace and have values in line with the sustainable objectives of the company.

David A. Lubin and Daniel C. Esty (2011) try to differently answer the research question by suggesting creating a vision, then executing it, and finally “building a sustainability performance system” (p. 81). The authors suggest “four stages of value creation” (p. 71) in the context of creating the vision (David A. Lubin and Daniel C. Esty, 2011). The first step is about suggesting firms to operate the same activities but trying to modify the way the latter are performed such that these firms obtain a superior position with respect to competitors (David A. Lubin and Daniel C. Esty, 2011). The second stage occurs when firms revise “products, processes, and whole systems” with the aim of getting optimal results in terms of efficiency and management of risks (David A. Lubin and Daniel C. Esty, 2011, p. 72). The third stage regards obtaining increased revenues and growing by innovating the **core business** for sustainability; David A. Lubin and Daniel C. Esty (2011) mention the example of Dow’s “2015 Sustainability Goals” that enabled the firm to design “new products or technology breakthroughs” in different areas with respect to their traditional core business (p. 72). Firms enter the last step when they “exploit” sustainability “as a source of differentiation in business model, brand, employee engagement, and other intangibles, fundamentally repositioning the company and redefining its strategy for competitive advantage” (David A. Lubin and Daniel C. Esty, 2011, p. 74). Once the vision is defined, it needs to be implemented in five areas, as suggested by David A. Lubin and Daniel C. Esty (2011). In leadership, the authors suggest the establishment of **CSO** positions (*Chief Sustainability Officers*) and “to allocate the necessary resources and responsibilities” (p. 75); the role of CSO is to guide firms during the sustainability transformation and to “visualise goals and

professionalise the process of aligning vision with business strategy” (David A. Lubin and Daniel C. Esty, 2011, p. 75). For what it concerns the strategic function, the execution of the vision also implies that “sustainability strategies” are formulated (David A. Lubin and Daniel C. Esty, 2011). In the management function, David A. Lubin and Daniel C. Esty (2011) suggest “firms to integrate sustainability objectives into day-to-day management” (p. 78). In the area of reporting and communication, in order to put sustainable strategies into practice and to publicise results, companies should develop tools to “measure benefits and understand costs”, as well as to mature skills to efficiently report sustainability matters.

David A. Lubin and Daniel C. Esty (2011) conclude their study by stating that “companies seeking competitive advantage from sustainability must match innovative green product offerings and business models with strategic execution” (p. 83).

Another focus on how to transition to SBMs is given by Bocken, N. M., and Geradts, T. H. (2020) who highlight the importance of the **drivers of dynamic capabilities** (mentioned earlier in the sub-chapter) to enhance the innovation of sustainable business models in companies. Drivers are, for instance, the “focus on shareholder and stakeholder value” (p. 11), the ability to embrace ambiguity and uncertainty by abandoning what is familiar, or the effort to enable organisations to become more resilient (Bocken, N. M., & Geradts, T. H., 2020). Besides, dynamic capabilities can be fostered through innovating by collaborating, through undertaking “strategic investments in long-term sustainability projects” (p. 13), or through hiring talents that have values in line with the ones of the enterprise (Bocken, N. M., & Geradts, T. H., 2020). Bocken, N. M., and Geradts, T. H. (2020) also stress the importance of educating and training the workforce once the business model innovation for sustainability has been introduced in firms. Plus, the involvement of “top and senior

management” in organisations is crucial to develop dynamic capabilities (p. 13), and the role of these leaders is to bridge the various layers of hierarchy in firms to bring everyone to collaborate for sustainability (Bocken, N. M., & Geradts, T. H., 2020).

Drivers of dynamic capabilities are, as well, a firm-specific innovation programme, budget allocated for experimenting SBMI, having time and people dedicated to the innovation for sustainability, and incentive schemes for employees (Bocken, N. M., & Geradts, T. H., 2020). To develop dynamic capabilities it is also very important to have suitable measurement of the performance in sustainability matters, because the innovation of business models is a complex process that takes time and cannot be measured in the same way as usual business; as Bocken, N. M., and Geradts, T. H. (2020) report in their study, **sustainable business model** “is going to be small for long and it's not going to be profitable, it's not going to scale as fast but if you would hold it up to the same KPIs as your normal business then it's never going to work” (p. 14).

In conclusion, sustainable business model innovations are encouraged by today's society, can derive from imitation, or can be felt really as an urgency. SBMI can give benefits and competitive advantages to firms if undertaken with intention. However, despite the literature studies conducted so far, there still exist gaps in how the innovation of business models for sustainability happens and how to *practically* transition to more sustainable business models. For this purpose, this thesis aims to give examples of real existing companies and explain how these firms planned and are planning to undertake sustainable business model innovations.

V. CHAPTER 2: RESEARCH METHODS

In order to answer the research question and fill the literature gaps, as mentioned, this thesis provides a multiple case study of three manufacturing companies; therefore, this chapter explains the research design and the methodology used to conduct the study.

2.1 Research design

Qualitative research

The author of this thesis believes that **qualitative research** is the best option to answer the research question. Indeed, the latter aims at studying the sustainable business model innovations and transitions in three textile manufacturing companies in the Lombardy region. The **manufacturing sector** was chosen because, as previously explained, on one side it is very polluting, and on the other side, it can provide concrete, interesting examples of how to tackle climate change. Besides, this thesis wants to focus only on the **Lombardy region** because, as Lombardia Speciale (2019) defines it, “the manufacturing sector in Lombardy was, in 2018, the cutting edge in Europe”, and it still maintains a position among the top “most industrially advanced” regions in Europe (Lombardia Speciale, 2021).

Qualitative research has the goal of generating theory: in fact, this whole thesis contributes to the literature gap, while the Literature Review chapter gives the basis of what is known so far and from which this thesis develops. Aspers, P., and Corte, U. (2019) “define **qualitative research** as an iterative process in which improved understanding to the scientific community is achieved by making new significant distinctions resulting from getting closer to the phenomenon studied” (p. 139). The authors (Aspers, P., & Corte, U., 2019) also add that qualitative research is made by a

part that tries to understand “how to do things”, and the other “the outcome” (p. 155); plus, qualitative research implies interpretation, it is “multi-method” and “interdisciplinary” (p. 147). Miles, M. B., and Huberman, A. M. (1994) describe that qualitative research usually studies situations that represent the “everyday life of individuals, groups, societies, and organisations” (p. 6); the researcher, as the author of this thesis did, needs to identify the “logic, arrangements, explicit and implicit rules” of the context studied (p. 6). Aspers, P., and Corte, U. (2019) support this concept saying that qualitative research aims at studying in depth “processes in the social world” (p. 146), capturing their implications and their causal relationships. Miles, M. B., and Huberman, A. M. (1994) also add that qualitative research wants to study how people “understand, account for, take action, and otherwise manage their day-to-day situations” (p. 7); indeed, this thesis aims at explaining how the every-day processes in the firms occur, and what periodical decisions employees take. Miles, M. B., and Huberman, A. M. (1994) highlight that qualitative research has the strength of analysing “ordinary events in natural settings” (p. 10), this means that this type of research, as mentioned, wants to explore the daily life, in this case, of organisations. In addition, to accomplish the latter, qualitative research needs to gather data mainly on-sight (Miles, M. B., & Huberman, A. M., 1994); to this purpose, the qualitative research strategy and analysis of this thesis is conducted on **multiple case studies**: each company represents a case study on its own, that is then compared with the others to find similarities and differences. Indeed, as it is the case of this thesis with the multiple case study analysis, the authors (Miles, M. B., & Huberman, A. M., 1994) also add that qualitative research stresses “a specific case” (p. 10) and studies it in its environment. In fact, with qualitative research the author “captures data” “from the inside” of the three textile manufacturing enterprises; this data, however, should be kept intact to preserve its originality (Miles, M. B., & Huberman, A. M., 1994, p. 6).

Qualitative research is usually conducted over a relatively long period of time, this enables the researcher to not only understand the “*what?* or *How many?*” but also the “*how* and *why* things happen” (Miles, M. B., & Huberman, A. M., 1994, p. 10).

One method that is used in qualitative research is “intensive interviews” (Aspers, P., & Corte, U., 2019, p. 146). Hence, the author of the thesis has chosen to gather data mainly through **interviews**, but also through observations of participants and processes, and by online resources, in order to have the triangulation of data sources (which gives more authenticity as data comes from different sources). As perfectly explained by Miles, M. B., and Huberman, A. M. (1994), the analysis of the case studies of this thesis implies mainly words: the quotations of the interviewees; these ‘words’ (that give a detailed description of the sustainable transitions of the three firms) are used to conduct the case study analysis, to give conclusions about *how* and *why* companies undertook or plan to undertake sustainable transitions, and to give contributions to the literature gap.

The qualitative research is an iterative and open ended process, and the research question is better delineated or modified at each step. Aspers, P., and Corte, U. (2019), indeed, believe that, in this iterative process, “data, concepts and evidence are connected with one another” (p. 140). There are therefore interactions between the data that is collected and the analysed data: the former is detailed and covers broad topics of interest, as for instance other projects of the companies; the analysed data is data that is specifically relevant to directly answer the research question and it contributes to the literature gap.

As to answer the research question, the method used is **qualitative process research** that studies *how* companies planned and are planning to innovate their

business models for sustainability. The *subject of the research question* is companies in the manufacturing sector in Lombardy, the *action* is the sustainable transition or innovation, and the *context* is business models.

The approach followed in the qualitative research is the **inductive**, that aims at expanding theory starting from observations in the real world. Subjectivism characterises this thesis, as knowledge is formed also considering the contexts in which firms operate, and the world is interpreted thanks to the situations in which processes occur. Indeed, the research question answers *how* and *why* companies transformed or want to transform their business models.

As defined by Thomas, D. R. (2003), “the inductive approach is a systematic procedure for analysing qualitative data where the analysis is guided by specific objectives” (p. 2). This type of approach is useful to “understand meanings in complex data” (p. 3) and it is used to capture specific themes from the data, then, from these themes, to derive the findings of the research (Thomas, D. R., 2003). In addition, Hayes, B. K., Heit, E., and Swendsen, H. (2010) state that “inductive reasoning involves making predictions about novel situations based on existing knowledge” (p. 278). The authors (Hayes, B. K., et al., 2010) also report that the reasonment that people usually do in their daily life coincide with the inductive approach: “categorization, probability judgement, analogical reasoning, scientific inference, and decision making” are examples of “cognitive activities” that use the induction method (p. 278). Thomas, D. R. (2003) presents then three major purposes of the inductive method: first, this approach builds a summary from the “extensive and varied raw text data” (p. 2); second, the method associates “the research objectives” with “the summary findings”, highlighting relationships between them and making sure that these linkages are “transparent (able to be demonstrated to others) and defensible (justifiable

given the objectives of the research)” (p. 2); third, from the data, the inductive method recognises “experiences or processes” and, from the latter, the method builds a “model or theory” (p. 2).

Multiple case study analysis

Cleland, J., MacLeod, A., and Ellaway, R. H. (2021) **define** a case study as “an in-depth investigation of an organisation, an individual, a context or a phenomenon, single or multiple, set in a real-life context, bound by time and space, which aims to develop a deep comprehension of how the object of the research relates to its context” (p. 1133); a case study is also “a group of methodologies that set out how inquiry should be designed, conducted and reported” (p. 1132). Moreover, Cleland, J., MacLeod, A., and Ellaway, R. H. (2021) argue that case study analysis is composed of three “methods: observations, interviews, and documents” (p.1138). Case studies have both an *exploratory nature* and an *explanatory* one; plus, there exist, in addition to these two types, also “descriptive case studies” (Yin, R. K., 2009, p. 8). Case studies can be classified as “embedded” if one case is composed of several units of analysis; or they can be “holistic” when one case corresponds to one unit of analysis (Cleland, J., et al., 2021). Yin, R. K. (2009) describes that the need to **recur** to case studies emerge from “the desire to understand complex social phenomena”, and they enable the researchers to explore in depth “real-life events” (p.4). Indeed, Yin, R. K. (1981) states that case studies are useful to explore concepts, to expand theories, but also to describe situations “or to test explanations for why specific events have occurred” (p. 98). Besides, researchers recur to case studies when they need to “examine a contemporary phenomenon in its real-life context” (p. 98), hence situations in which the phenomenon cannot be separated from its context (Yin, R. K., 1981). Case studies, indeed, “answer ‘how’ and ‘why’ questions” (Cleland, J., et al., 2021, p. 1133).

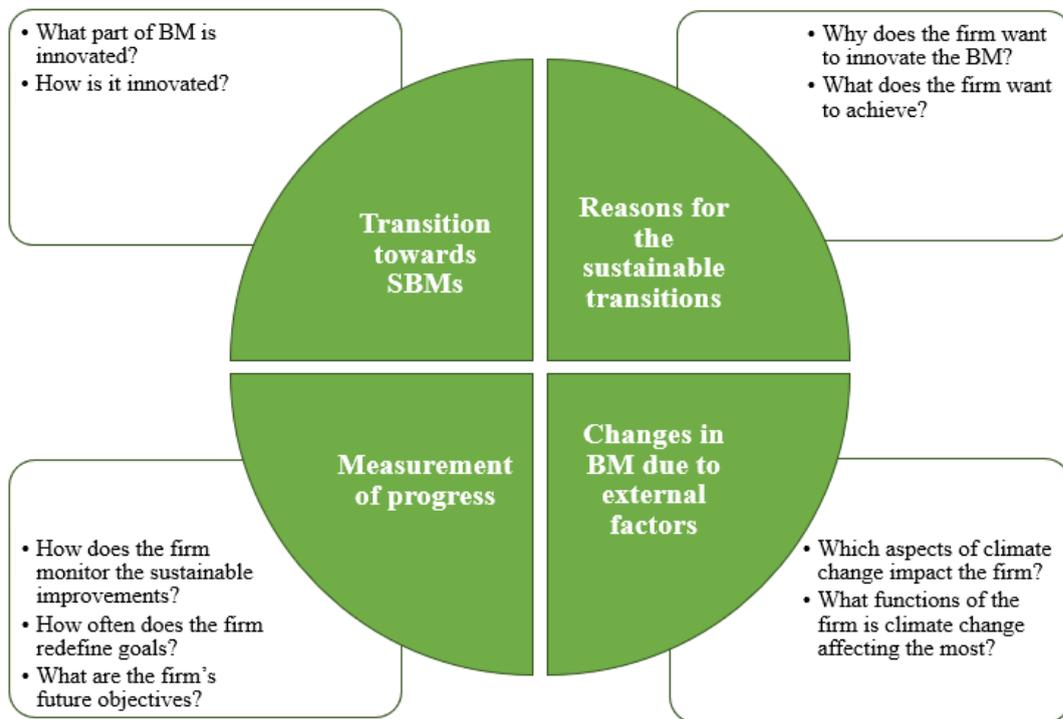
A **characteristic** of the case study method is that the variables at the researchers' disposal are much more (in numbers) than the data points (the "number of cases") (Yin, R. K., 1981, p. 98). In addition, typical of case studies is the examination of the "knowledge utilisation process" that foreruns recommendations and interventions (Yin, R. K., 1981, p. 100). Conducting case studies, on the one hand, with an 'Emic' **perspective** (that is to say "from within"), the researcher has the advantage of being familiar with the situation and knowing "how things work" (Cleland, J., et al., 2021, p. 1137). On the other hand, however, having an 'Etic' perspective ("from the without"), the case study analysis has the advantage of being objective, and the researcher is neutral and not influenced by "expectations, history or relationships" (Cleland, J., et al., 2021, p. 1137). Additionally, case studies are different from history as the former "adds two sources of evidence" to it: case studies proceed on observing directly the events under study, plus case studies have the chance to be able to interview "the persons involved in the events" (Yin, R. K., 2009, p. 11). Case studies also differ from experiments, since in the former it is not possible to manipulate the behaviours of the "contemporary events" (Yin, R. K., 2009, p. 11).

In this thesis, the author opted to conduct a **multiple case study analysis** instead of the single case study. Therefore, for each company (Confezioni Manifattura Bini, Fimotex, Stamperia Olonia) a single case study is done to understand which sustainable innovations the companies went or are going through, and the reasons behind these changes. This thesis, opting for the "multiple-case design", enables the possibility to write conclusions after the analysis of all the cases, as suggested by Yin, R. K. (1981, p. 101). In the **multiple case study analysis**, on the same topic, indeed, each case study is conducted individually, then, in the end, results for each case are compared, and it is shown whether they confirm each other's findings or not (Yin, R. K.,

1981). Additionally, Yin, R. K. (1981) states that “once a phenomenon has been shown to occur in all cases, the concluding step is to develop a general explanation or synthesis across the cases” (p. 102). Each case study needs to be built following a design, a sequence of **topics**, which should also be recognised in the other cases (Yin, R. K., 1981); this is indeed done in this Analysis following the sustainable business model innovation **framework**, shown in **Figure 2.1.1**, that was ideated by the author of this thesis, and it better visualises the issues raised in the research question. Regarding the collection of data, Yin, R. K. (1981) explains that a **protocol** is needed: this tool contains, for example, the topics to be covered, the types of people to interview, which documents need to be consulted; this information is needed to similarly conduct the various case studies. The last step in the multiple case study is to compare the individual findings and explanations of each case: the more similar they are, the easier it is, for researchers, to give a valid general interpretation or description (Yin, R. K., 1981). Indeed, for this multiple case analysis, findings for each company are displayed, a summary for each company is provided, and finally, a cross-analysis of the case studies, a discussion and a conclusion with suggestions and contributions are presented.

Figure 2.1.1. *Sustainable Business Model Innovation Framework.*

SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK



(Pivotto V., 2023)

2.2 Methodology

Data collection method

Primary data about the case studies is obtained mainly through **interviews**.

Alshenqeeti, H. (2014) believes that an interview “is not merely a data collection tool, it is rather a natural way of interaction that can take place in various situations” (p. 42). Differently, Gubrium, J. F., and Holstein, J. A. (2001) state that an interview is “a face-to-face conversation with a purpose” (p. 1 of Part 1, Forms of interviewing), “an extended, open-ended exchange” (p. 2 of Part 1, Forms of interviewing), that occurs between the interviewer and the interviewee; the former has the role of both asking questions and actively listening, and the latter of answering the questions. Other **tasks**

that the interviewer needs to comply with are: to pay the maximum attention to the interviewee; to spur them to reply with true and genuine answers; to not exercise influence on the received answers or to push the respondent to answer in a certain way (Gubrium, J. F., & Holstein, J. A., 2001). In addition, the interviewer should not get engaged with what is said by the respondent, judging the answers or replying to the interviewee's personal questions about the interviewer (Fontana, A., & Frey, J. H., 2000). The interviewer should also be capable of creating a positive and interesting atmosphere such that the "interviewees would feel more at ease and thus talk freely" (Alshenqeeti, H., 2014, p. 41). Fontana, A., and Frey, J. H. (2000) also add that when framing the interviews, the interviewer should carefully consider the **language** used in the questions: from it, in fact, it is possible to decide if the question is more leading, or instead neutral, descriptive, or instructive, etc. Plus, non-verbal **communication** is also extremely important to capture: behind it, personal attitudes, beliefs, opinions, or feelings can be hidden (Fontana, A., & Frey, J. H., 2000). Finally, Alshenqeeti, H. (2014) highlights the importance, at the end of the interview process, of letting interviewees ask further questions or leave comments.

The method of the interview has been chosen for this multiple case study analysis as it directly gives data from first-person meetings, it enables to better explain business processes, and *how* and *why* companies innovate their business models for sustainability. In fact, the **positive aspects** of interviewing directly people from the three selected firms are that, firstly, it forces the direct interaction with the interviewee and hence it can capture also the tone of voice and the **gestures** of the person (as supported by Fontana, A., and Frey, J. H. (2000) just above); secondly, it is very easy to ask further questions and **investigate deeper** in what is said, more than if answers were written; thirdly, the interview enables to stop the interviewee and ask for

explanations, examples or details, in case something is not clear; lastly, the direct interaction and the conversation-interview let the interviewer build a **personal relationship** with the interviewee, therefore respondents feel more at ease and, consequently, they are more likely to open up and share experiences, anecdotes or facts.

In fact, interviews on the one side, “generate large amounts of data” (p. 41), but, on the other side, they enable the researcher to collect data that would not be so easily accessible using other data collection methods (Alshenqeeti, H., 2014). Additionally, Alshenqeeti, H. (2014) states that a good interview “flows naturally and it is rich in detail”⁷ (p. 41), indeed the quality of an interview is seen by the short questions of the interviewer and the long replies of the respondents.

Tailored interview guides⁸ are used as the basis for the conversation-interview. The typology of interview used is **semi-structured**. The semi-structured type (standing in between structured and rigid interviews, and unstructured flexible ones) gives, on the one side, flexibility to the interviewer to ask questions that are more related to the answers of the interviewee or to change the order of the questions, but, on the other side, it gives control to the interviewer as it forces the interview to follow the track of the topics included in the interview guide.

DiCicco-Bloom, B., and Crabtree, B. F. (2006) state that it often happens that **semi-structured interviews** are the only source of data in the context of qualitative research; however, for the analysis presented in this thesis, interviews are not the only source: they for sure, though, hold great importance, but also online resources and observation of processes and participants are used. The authors (DiCicco-Bloom, B., & Crabtree, B. F., 2006) also believe that semi-structured interviews “are usually

⁷ Alshenqeeti, H. (2014) cites Dörnyei (2007). Dörnyei, Z. (2007). *Research Methods in Applied Linguistics: Quantitative Qualitative, and Mixed Methodologies*. Oxford: Oxford University Press.

⁸ The different interview guides used for the multiple case analysis are shown in the Appendix section.

scheduled in advance at a designated time and location” (p. 315); indeed, all the meetings with the interviewees were decided by the author of this thesis together with them, based on each other’s availability. In addition, individual semi-structured interviews usually “take between 30 minutes to several hours to complete” (DiCicco-Bloom, B., & Crabtree, B. F., 2006)(p. 315), this is indeed the case of this analysis, whose interviews took on average 1 hour per interviewee. Plus, DiCicco-Bloom, B., and Crabtree, B. F. (2006) state that in this type of interview, most of the times each interviewee is interviewed only once; in fact, for the multiple case analysis, the subjects were interviewed only one time, with some exceptions where the author of the thesis felt the need to meet again these people to ask a few more questions that still resulted unanswered after the analysis.

The **interview guides** were completely **built** by the author of the thesis and the questions were divided based on 5 macro arguments (see just below); each of these arguments contained a few questions that enabled the researcher to collect data to answer the research question. In fact, DiCicco-Bloom, B., and Crabtree, B. F. (2006) report that interviews are usually conducted using, as a guide for the conversation, these “predetermined open-ended questions” (p. 315). The interview guides cover the following **topics** (from general questions to more specific ones, as suggested by Fontana, A., and Frey, J. H. (2000)): introduction, transitions to sustainable business models, reasons for these transitions, measurements of the progress, and influence of climate change variables on the companies. Slightly different types of interview guides are prepared, depending on the roles covered by the interviewees: for instance, the interview guide of the CEO/owner is different (but similar) from the one of the sustainability director. To be noted is the fact that the interview guides were subject to changes after the first tests on the interviewees; DiCicco-Bloom, B., and Crabtree, B.

F. (2006) indeed report that this practice is characteristic of individual semi-structured interviews.

Limitations of the method

The interview method can present some limitations. Firstly, the interview is a very subjective way of collecting data, especially because the interviewee can give answers that depend on the circumstances, the feelings they have, the prejudices, or other influencing factors, such as the ones suggested by Alshenqeeti, H. (2014): the time available, what respondents are allowed to disclose, or by what they think the interviewer wants to hear. The interviewees might also be answering differently to the same questions, if the interviewer changes: this attacks the **reliability** of data. However, in this thesis, this limitation is reduced as the interviewer is always the same person, that is to say, the author of this thesis. Secondly, another limitation is the **validity** of data: the extent to which the data collected can hold confidence and can be considered representative of a larger population. This issue can be solved as, being a multiple case study, the analysis presented here is valid specifically for the companies studied, and it should be taken only as an example by firms that wish to undertake the same or similar innovations. Thirdly, data collected through interviews can show **incoherence** in the case in which, to the same question, *different* interviewees answer stating different versions of the sustainable innovations. In this case, the limitation can be solved by asking deeper questions that aim at knowing the details of what was stated; in most cases indeed, answers might look contrasting or different until details are revealed. In addition, to solve the issue in which the *same* interviewee answers giving opposing responses, Alshenqeeti, H. (2014) believes that the interviewer can ask the respondent “to sum up and clarify the points they have made” (p. 44), such that incoherence is shown and the truth emerges. Fourthly, Alshenqeeti, H. (2014) mentions

that interviews are “time-consuming with regard to both data collection and analysis” (p. 43).

Analytical method

The meetings and interviews with the staff of the three companies were conducted mainly on sight, but also by telephone and video-calls, depending on the availability of the author and of the people interviewed. In addition to the proper interviews, an initial tour of the plants and a description of the processes that occur in each company were made; plus, interviewees before starting their interviews often told the author the history of the company, some personal thoughts and introduced the firm and their workers. Each meeting was recorded by the author of the thesis, the content was then transcribed, in separate files, within three days from when they were conducted. Once the analysis was concluded and the thesis completed, the recordings were deleted, as it is suggested by DiCicco-Bloom, B., and Crabtree, B. F. (2006). The transcription was made in the original language, reporting exactly the words used by the interviewees. It was taken note of who stated what and almost no filter from the author of the thesis was inserted; only some comments were added in separate parts to highlight important statements or clarify something that the interviewees took for granted at the moment of the interview. Once all the text is written, the process of analysis starts. The researcher analyses data by making interpretations, as a result, “the findings are shaped by the assumptions and experiences of the researcher” (Thomas, D. R., 2003, p. 4). The content of the meetings was assigned based on their content: some parts of the quotations were part of the description of the company, some others were part of the production process, some others were part of the possible sustainability projects, and the rest were answers to the proper interviews. Once the text is divided, a copy of each section was made. The author used the copy to transform the quotations into clear and

readable text, citing the interviewees and what they said in quotation marks. This process was made for each interviewee of each company. Then, in the cases in which for the same company more than one person was interviewed, the author inglobated the quotations of all people in the text, giving it a logic and trying to be as detailed as possible. From the quotations to the text, only non-relevant content was deleted: topics that were doubled or that did not help in any way to answer the thesis research question. To this purpose, indeed, the theory says that it is the researcher's choice to determine which data is important and which to omit (Thomas, D. R., 2003). Once all the sections of the case studies were finalised in clear, readable, logical text, the latter was translated from the original language (Italian) to British English. The translation was delegated to professional translating websites that could translate the highly technical description of the case studies in a way that readers of this thesis can easily understand. The author, for each section of the case studies, checked the translation such that it did not alter the original meaning and made sure that the quotations were accurate. Finally, a summary for each case study was made, showing *what*, *how* and *why* each company innovated their business models to become more sustainable. Once all the case studies were complete and translated, they were reported in the thesis.

The division in different sections of the case studies allows to contribute to answering the research question, and consequently contribute to the literature gap: from the reality and practical cases to theory.

Barriers and challenges of the data analysis

Retrieving information from the three companies required a lot of **time**, availability and patience. It was not immediately possible to gather all the necessary data from the first meetings with the companies. Therefore the following meetings helped the

collection of the needed data, in order to have a full complete vision of the sustainable innovations of the companies.

The analysis of data was difficult because the author of this thesis needed to build a **readable text** from the answers of the interviewees; the latter were not always clear in what they wanted to say, they often left statements incomplete, they sometimes contradicted themselves or stated something that looked different from their colleagues' statements. It was hard to construct a formal and clear text and inglobate in it the answers of multiple respondents, giving as many details as possible. It often happened, indeed, that interviewees of the same company stated the same concept with different words or in different ways; the ability of the author was shown here by taking everyone's contribution and giving it all back in this thesis.

Finally, the author had to carefully **report the interviewees' words** in the case studies, paying attention to the quotations and who stated the concepts. In addition, the author needed to check the **translation** that was made available from the translating websites and correct every statement such that the accuracy of the quotations was maintained.

Sampling method

The *unit of analysis* is the manufacturing sector in the Lombardy region, in Italy. The *unit of observation* is: employees, managers, CEO/owners of the selected companies. The *cases* are: Confezioni Manifattura Bini, Fimotex, Stamperia Olonia.

To analyse these companies, the research approach of **multiple case studies** is chosen. The aim of the multiple case study is to describe and explain the processes and the sustainable innovations that the companies plan to undertake or have already started doing. The case studies are operated in the extensive mode, that is to say, research is conducted over a relatively long period of time; the whole process of the

thesis, indeed, took overall about 7 months. The *unit of analysis* is, in fact, the multiple case studies where the three enterprises are interviewed. The *data* of the case studies is the existing data, gathered through online materials, plus new direct data that is collected through interviews and observations. The *type* of analysis is inductive, from practical observations to the creation of theory and contribution to the literature gap. The *population* of the case studies is the enterprises in Lombardy; the *sample* is textile manufacturing enterprises in Lombardy; the *cases* are Confezioni Manifattura Bini, Fimotex, Stamperia Olonia; the *data points* are the employees, managers, CEO/owners of these three firms.

The firms analysed in this thesis were chosen among the enterprises belonging to the manufacturing sector in the Lombardy region, in Italy. Among all the possible firms, non-sustainable companies or enterprises that do not have sustainable plans for the future were excluded. The chosen companies are the ones that fit the thesis topic and that agreed to collaborate with the author of the thesis, in this project. The selected companies are similar firms: indeed they present common aspects thanks to which comparisons, about sustainable transitions and innovations in the sector, can be made.

Here is presented an overview of the **manufacturing sector in the Lombardy region** in order to better delineate the context of the three studied companies.

In 2019, according to Industria Italiana (2022), the industry, in Lombardy, counted 84.912 companies, 903.826 workers, 257 billion euros of turnover, and 135 billion euros in exports. This data made the region the best one in Italy: indeed, manufacturing in Lombardy, in 2019, generated 26% of national turnover, 27% of national manufacturing exports, and it contributed to 24% of the national employment in the industry (Industria Italiana, 2022). The sub-sectors belonging to the bigger industry of manufacturing are: “manufacture of machine tools”, “metallurgy and metal

production”, “chemical sector”, “rubber-plastics sector”, “textile sector”, “pharmaceutical sector”, and “food production” (Industria Italiana, 2022). In addition, Lombardia Speciale (2021) states that, “in the first trimester of 2021”, the “manufacturing production in Lombardy” grew by 8.7% with respect to Covid times in 2020; by contrast, in the same trimester, the whole Italian industrial production only rose by 1%, from 2020. This shows the reactivity and resilience of the Lombardy region to get back from difficult times (Lombardia Speciale, 2021). Indeed, in 2021, Lombardy was one of the top three European regions “most industrially advanced” (Lombardia Speciale, 2021). Polis Lombardia (2022) points out that in 2021 the textile and footwear-clothing sectors had hard times recovering from Covid-19; despite this, “in the second trimester of 2022”, with strong growth, these two sectors managed to reach 2019 levels.

This section contains the presentations of the three analysed enterprises in order to give an overview of the companies to the reader, before digging deeper into the case study analysis.

Confezioni Manifattura Bini is a company based in Lombardy, Italy, born in 1925 (Confezioni Manifattura Bini, 2023). During the Second World War, Bini manufactured uniforms for the Italian Army; once the war ended, Bini started producing “work clothes in general: bibs, overalls and outerwear”, although their most famous product was “the overalls for workers, the toni” (Confezioni Manifattura Bini, 2023). In 1976, “Confezioni Manifattura Bini decided to deepen its presence in the field of work wear”; in 1994, “articles intended for safety” were included in the production; finally, Bini added to their production all “PPE: shoes, filters, gloves, hearing protectors, goggles, helmets” (Confezioni Manifattura Bini, 2023). Later, machineries dedicated to the customization of garments (embroidery, screen printing, pad printing, digital printing) were installed in

the plant; in 2010, they expanded the production to “products dedicated to events and/or corporate or associative events (as for instance, gifts and corporate gifts), and items intended for Sports and Amateur Societies, offering dedicated materials and equipment” (Confezioni Manifattura Bini, 2023). The two major strengths of Confezioni Manifattura Bini are the quality of the products and the “efficient on-time delivery” (Confezioni Manifattura Bini, 2023). Their motto is “Getting together is a beginning ... Staying together is progress ... Working together is a success!” (Confezioni Manifattura Bini, 2023).

Fimotex is a company situated in Lombardy, Italy, established in 1983 (Fimotex, 2023). It started as a factory to produce plush-type fabric; in 1987 was installed “a sector for finishing the fabric produced”; in 1999 the owners “decided to remove the weaving department, making way for a new, highly automated finishing line”; finally, in 2011, a new building was built: in it “a small dyehouse, to perform washing and bleaching”, and “an innovative finishing line, to provide space for experimentation with new treatments”, were installed (Fimotex, 2023). Fimotex finishes and ennobles “fabrics for apparel, furniture, and mattresses”; it is specialised “in the processing of cotton and acrylic jerseys, both printed and plain, interlock, stretch and technical fabrics for sportswear, fabrics for pyjamas, knitted fabrics for upholstery and clothing”; plus, Fimotex processes “mattress fabrics and all fabrics up to a height of 260 cm” (Fimotex, 2023). The company privileges investments that aim at respecting the environment, saving energy and improving the processes (Fimotex, 2023).

Stamperia Olonia is a printing company, part of the Liberty Group, based in Lombardy, Italy (Stamperia Olonia, 2023). The company was established in 1969 and it is now “a leading contract manufacturer of printed natural fabrics for home and apparel”

(Stamperia Olonia, 2023). They started the international expansion in the 90s, when they invested in the latest technologies and adopted the company philosophy of top quality, innovation and high-end technology (Stamperia Olonia, 2023). Stamperia Olonia “can print on all natural textile fibres up to 320 cm useful height, digitally and traditionally with pigment dyes and reagents”; their production cycle starts from the bleaching and lasts until the final quality control (Stamperia Olonia, 2023). The textile industry is now demanding a more sustainable production; however, more than 15 ago Stamperia Olonia began its engagement in sustainability (Stamperia Olonia, 2023). Through the years, Stamperia Olonia has obtained the following certifications: Global Organic Textile Standard, OEKO-TEX Class 1, OEKO-TEX Class 2, ISO 9001, ISO 14001, ISO 45001, Formaldeide Free, Accredia; they also have a Politica per il Sistema Integrato and a Codice Etico (Stamperia Olonia, 2023).

VI. CHAPTER 3: CASE STUDIES ANALYSIS

Multiple case study analysis

In this section, a case study of each company analysed is presented: indeed, each firm represents a single case study. The firms are here described, the production process is detailed, and then answers for the research question and its sub-questions are provided; finally, descriptive results are outlined in each case study summary. These three case studies, in Chapter 4, are then compared giving birth to a multiple case study analysis with cross-analysed results.

To note is that all participants voluntarily accepted to participate in this project, they gave their consent to be interviewed, they agreed to be recorded and cited personally in this analysis. Interviewees were informed in advance of being recorded and they were asked, at the end of each interview, if they had any doubts, questions, remarks or comments to add.

3.1 CONFEZIONI MANIFATTURA BINI

All information included in this case study was retrieved from Confezioni Manifattura Bini on March 31st and May 5th 2023.

Description of the company

Using Marco's words, "Manifattura Bini provides garments and gives support" to customers who "turn to us because they ask for work clothing, ask for PPE, the accident prevention" (Zucchi M., 2023). "What we are able to give is a free consultation with quality products, or niche products, or consumer products", says Marco; this way

in fact, Bini manages to "diversify the demand a little" (Zucchi M., 2023). **Image 3.1.1** shows the embroidery machine of Manifattura Bini.

Image 3.1.1. Embroidery machine in Confezioni Manifattura Bini.



(Pivotto V., 2023)

Production process

Manifattura Bini is responsible for the customization of items (Zucchi M., 2023). In Bini you can also do "special productions"; as Marco explains: "if you see an article in the catalogue and you want it similar or equal, but in a different colour, if the necessary quantity can satisfy the purchase of a material to make this production, we make the items ad hoc" (Zucchi M., 2023). As for customization, Bini customises the products

that are present in its catalogue: these products are sent from outside and then are customised within Manifattura Bini (Zucchi M., 2023). Among the various possible customizations, in Bini "we can do embroidery, digital printing, direct printing, digital transfer, classic transfer, and pad printing" (Zucchi M., 2023).

To perform the **embroidery**, the customer's logo is transformed from the embroiderer machine into a vector logo (which is "the company logo given in a vector format that could be eps or pdf and transformed into machine language") (Zucchi M., 2023). The embroidering machine "does not see the logo, but performs vector tracking"; "vectors are a vector line that can be curved or straight depending on how it is made", the machine then generates "a curve or a line", the result of which is "the customer's logo", as Marco explains (Zucchi M., 2023). "This is the basic principle for customisation, which is applied both for embroidery and for prints" (Zucchi M., 2023).

Direct printing is carried out on the innovative Epson machine (Zucchi M., 2023). Marco tells: "you insert the T-shirt or any material inside the machine, it works like a normal printer but, instead of printing on the sheet, it prints directly on the fabric that is inserted in the machine; the machine then passes and creates the drawing on it" (Zucchi M., 2023). The printing takes place through the "micro nozzles that let the ink (the colour) pass like a laser printer or a printer used at home" (Zucchi M., 2023). "This replaced screen printing" (Zucchi M., 2023).

"The **digital transfer** is the same, but instead of printing on the shirt, you print on a support that you then apply directly on the material", says Marco (Zucchi M., 2023). The logo or the design are, in fact, printed in reverse and then are applied on the fabric (Zucchi M., 2023). Marco explains the difference "between digital printing and a transfer": "digital printing is recommended on light products, it can also be done on dark ones but for large quantities" the costs would increase too much (Zucchi M., 2023). "A transfer instead, whether it is a light product or a dark product, you can then do even

the smallest details"; once the logo is printed, in fact, on it glue is applied, which then "sticks only where the ink is", and this causes that "even the smallest details" turn out well with digital transfer (Zucchi M., 2023). "Glue is fixed with processes, then when you apply" the printed logo on the fabric, "the glue sticks and melts with the fabric" (Zucchi M., 2023).

"The **classic transfer**, instead, is a pure carving material, which could be pantone colours, particular colours, glitter, etc., but is simply carved by the plotter," explains Marco (Zucchi M., 2023). However, this personalization technique has limits: "there must not be very complicated or very thin logos" (Zucchi M., 2023). With the classic transfer the logo is carved and "then applied with the adhesive support" (Zucchi M., 2023). In addition, "there are standard supports where you can first print, and then cut (so there is no more standard colour, but you make the colours) and the process is the same", says Marco (Zucchi M., 2023).

As for **pad printing**, this "is used to pad all objects", "thus it is used for pens, for cases", or for anything rigid (Zucchi M., 2023). "A cliché with the image of the logo or the inscription is made", then the pad captures the ink, it moves on the cliché imprinting the logo with ink (Zucchi M., 2023). The ink that passes through the cliché marks the object placed below (Zucchi M., 2023). With the tampography technique it is possible to make very varied gadgets, ranging from "USB sticks to pens" (Zucchi M., 2023).

Finally, in Bini it is possible to make **stickers**, such as those to be applied on the heads of calendars (Zucchi M., 2023).

For other types of customizations, such as making balloons with the logo, diaries, laser engravings, etc., Bini addresses external suppliers (Zucchi M., 2023). In these cases, Manifattura Bini only deals with "pure trade" (Zucchi M., 2023). "We act as a link between the customer's request, the initial sending of the logo, the creation of the logo for each type of customization, the sending of the logo (once defined and

approved by the customer) to our supplier (who always sends us a graphic draft that I request, otherwise I do not accept anything)", the customer's approval of the graphic draft (Zucchi M., 2023). Manifattura Bini, therefore, makes "a mediation" (Zucchi M., 2023). "At this point, once the customer has approved the logo, we start the production, then delivery, and finally, in our turn we deliver. And we have a margin on the product" (Zucchi M., 2023).

Another service that Bini carries out is the **consultancy** to companies "in the area of safety" (Zucchi M., 2023). As Marco says, "we often come across RSPP (the head of security within companies)" (Zucchi M., 2023). It happens in fact that these people can be reluctant towards innovative products, which are more performing, but which need to be tested (Zucchi M., 2023). In the consulting service, Bini then launches a counter-proposal to these companies, often quality products and therefore with a higher price than expected (Zucchi M., 2023). "There, there are two cases: either the customer doesn't even consider it because it is expensive, or they start asking a question and say <but why is there such an expensive product on the market? >" (Zucchi M., 2023). Marco narrates: the customer "calls me and tells me: <listen, but why did you propose this PPE [FOOTNOTE personal protection equipment] compared to another? >" (Zucchi M., 2023). "Then I don't tell him the reasons"; instead, Bini at this point tries to fix meetings with these companies to solve their problems (Zucchi M., 2023). "You go into the company with the supplier or with the products, and you show what the market offers today" (Zucchi M., 2023). Bini pays attention to customers' problems and tries to offer them products that are suitable and attentive to their needs; to do this, however, Manifattura Bini must always be attentive to market news, needs to make many visits to the customer and establish an excellent relationship with the latter (Zucchi M., 2023). As Marco says, in fact, "you have to make friends with your client. My clients are all friends" (Zucchi M., 2023). Marco then adds, "we may be known as

an expensive supplier, but the 'expensive' is justified by the fact that I give you an innovative product, I give you advice, if you have a problem I'll come and solve it" (Zucchi M., 2023).

Moreover, when Bini supplies garments to client companies, for example Blåkläder garments, the company also provides a service: as Marco says, "we do size tests for all employees", "we write an operator card with name, surname, job, articles, codes and dowry (that is how many for every single article)" (Zucchi M., 2023). This card, "you get it signed, you place the order to Sweden, it comes all already customised or in some cases, where they are not big numbers, we customise it inside" (Zucchi M., 2023). "Then, once the material arrives, we make the individual package for each operator, we deliver the package with the name with inside the card, the manager of the company that receives the material comes to pick up the package", then, when it is delivered, the manager must sign the card, and in the end this card remains for any subsequent reorder" (Zucchi M., 2023).

Introduction to the interviewees

The owner of Manifattura Bini is Daniela Mandelli (Mandelli D., 2023). Daniela has held this position since 1997, and she explains: "before me there was my mother and my aunt, and before that my grandfather" (Mandelli D., 2023). With Daniela's predecessors, Bini was mainly a producer (Mandelli D., 2023). Daniela, coming at the head of the company in a period of globalisation in which the markets were no longer local but also opened to foreign competitors, had to "bring innovations": "Italy has found itself small in this world" (Mandelli D., 2023). Daniela explains her difficulties and challenges: "I have been looking for different markets, while maintaining our quality criteria. And so I looked for suppliers who could satisfy me in this. Because I saw that

unfortunately the production here in Italy was no longer possible, the costs were exaggerated, and I had no more market. So I inserted in those years the particular clothing, I inserted the PPE (personal protective equipment), something that Manifattura Bini did not have before" (Mandelli D., 2023). "Then, over the years I made catalogues, I made partnerships, ... With the Compagnia Delle Opere (CDO) I created the security section: we made a security district. We made a cartel between companies" (Mandelli D., 2023). This cartel included Bini, who was responsible for providing work clothing and PPE; there was a company that organised for safety by informing other companies of the cartel of new regulations or laws; there was also a doctor of the work; a person who provided safety courses; and a security technician (Mandelli D., 2023). Daniela concludes enthusiastically: "we gave a 360% service to every company. It was a group and we helped each other" (Mandelli D., 2023).

Marco Zucchi is the commercial manager of Confezioni Manifattura Bini (Zucchi M., 2023). As Marco says, "I deal with contacting companies, developing our products and making known our main features, what we can provide on work clothing, on PPE, on safety in general, and possibly also on gadgets and sports equipment" (Zucchi M., 2023). The intent of Bini, explains Marco, "is to promote the innovative products that we have introduced 6 years ago, with particular interest in comfort and durability" (Zucchi M., 2023). This allows Manifattura Bini "to have *elite* products" (which must be explained and made known to customers) but these products must also "go against trend" because, as Marco explains, "if you use an economic product, you will have a shorter lifespan (as far as durability is concerned), but a negative impact on the environment because you make more waste; instead, if you have a higher quality product, the item lasts longer in time and then we remove the famous ecological islands" present in the oceans composed of waste (Zucchi M., 2023).

Daniela finds satisfaction in her work thanks to "the diversification and the possibility of bringing innovation every day"; "every day is never the same" (Mandelli D., 2023). Daniela defines Bini as a dynamic and constantly evolving company, as demonstrated by its long-standing market presence (Mandelli D., 2023). Daniela shows her love for her company by saying: "I like to meet people like you, I like to know young people [in internship] who came 15 days ago, because everyone can bring their own contribution. I mean, I can bring my experience, but you give me yours. So it's nice to interface with people every day" (Mandelli D., 2023). "Human relationships are the main thing. Looking in the eye, understanding that this is a product rather than that one, it is quite another thing. We are not machines. I like to create something different every day" (Mandelli D., 2023).

Marco says that what satisfies him the most in his work is "to bring innovation and make the customer understand where we are going and where we want to bring our customers" (Zucchi M., 2023). Getting results and being effective is not always easy, as Marco explains: "it is clear that if everything was simple I would always be satisfied; the work is not easy, but it satisfies you when in the other side you see a return of what you are explaining" (Zucchi M., 2023). Marco adds that before, Manifattura Bini, when it presented itself to the companies "it was one of many"; now, when Bini proposes itself "with innovative products with certain regulations, you understand that in the other side, the interlocutor is more attentive" also thanks to the fact that "the world is changing a little", "and so this satisfies me because I was a bit of a promoter of this thing" (Zucchi M., 2023).

Bini finds its values in quality, people and the environment in which it is located (Mandelli D., 2023). "Everyone knows us for quality" confirms Daniela (Mandelli D., 2023). Bini works on quality materials, often coming from Italy, and with a dye that does

not harm people's health or the environment (Mandelli D., 2023). Fundamental according to the owner is also "believing in it, wanting to believe that something good can be done, that our mark must be an important mark and that we must preserve it both for us and also for everyone, for those who will come; because everyone, even if small, can do many things" (Mandelli D., 2023). "Our project is to dress people with quality products, which however have a long life and allow them to protect themselves, to work well, not to hurt themselves, and at the same time that do not affect the environment" (Mandelli D., 2023). Manifattura Bini wants to help people "be more aware of what they buy, that anything they buy impacts the environment" (Mandelli D., 2023). Daniela "likes to believe in the environment", this is also demonstrated by the fact that the main brands with which Bini collaborates (including for example Uvex and Blåkläder) share its own values (Mandelli D., 2023) (Zucchi M., 2023). As Daniela explains, "our choice and our commitment, in the continuous search for suppliers that are somewhat our ethics, our mission, our thought to carry this project forward; hence not so much and not always of products that are *made* with sustainable materials, but also sustainable products themselves. Because if a garment lasts 6 years it is more sustainable than a cotton product that maybe is worth nothing and that lasts a season" (Mandelli D., 2023).

As mentioned, among the companies that collaborate with Bini there is Blåkläder (Zucchi M., 2023). Blåkläder is "the brand that for us is at the top of the range" explains Marco (Zucchi M., 2023). "Blåkläder is a Swedish company, born in 1959; it is a giant of 8000 employees, with 6 owned factories in the world, and works according to the concepts of our grandparents or great-grandparents" continues Marco (Zucchi M., 2023). Manifattura Bini has introduced this brand, "as pioneers", "7 years ago on the Italian market", initially finding scepticism both for high costs and for the lack of notoriety; in recent years, however, as Marco says, "we have had excellent results,

especially for public bodies: we supply Lario Reti Holding; Brianza Acque; we are about to reach Como Acque; Gruppo CAP and a bit all those companies that supply water and gas" (Zucchi M., 2023). The characteristic of Blåkläder is that "they use first quality materials", "they use primary yarns" (such as cotton) that turn out to be much thicker than the average yarns (Zucchi M., 2023). Blåkläder makes "quality work clothes"; Marco explains: "this means that the t-shirts are washed at 60 ° C, the polo shirt idem, the trousers are washed at 70 ° C 80 ° C. Having a quality product, the latter is less damaged (so it can withstand higher temperatures) and therefore is more resistant to the stress of washing. Usually these are products that last 50 washes, withstand the wear and tear of the weather, the working and the rubbing. Since these fibres are very important, they guarantee long life and important washings" (Zucchi M., 2023). By washing at high temperatures, it is possible to reduce the washing times and consequently, all those polluting materials are not introduced "into the water, and therefore we also give wellness to the world around us", explains Marco (Zucchi M., 2023).

In addition to workwear, Bini also offers its customers "PPE products" (Zucchi M., 2023). For the latter, the Uvex brand, German, is another top of the range for Bini: quality shoes, certified bamboo fibre protective gloves, etc (Zucchi M., 2023). Marco explains: "with Uvex we advise companies", "with one of their employees we go to see the problem, we leave them samples, and we create the growth path together with the companies" (Zucchi M., 2023).

In addition, Marco explains that Blåkläder has Hitachi "as an institutional customer" (Zucchi M., 2023). "In Hitachi's catalogue, there is an antistatic coat made with carbon fibres", "but it is a very heavy material" because it is made for Nordic countries (Zucchi M., 2023). Manifattura Bini has asked Blåkläder and Hitachi to make "an antistatic coat with a lighter material" for the warmer Italian climates; as Marco says: "the design is by

Blåkläder, the product is ours: we sew it, we customise it, and it is in the catalogue, that is: practically Blåkläder became my customer" (Zucchi M., 2023).

Daniela adds: "as for embroidery, we have the best on the market: Madeira". This brand "is really one of the best yarn manufacturers", they are "very careful about products and how to create yarn" (Mandelli D., 2023).

Marco says that Bini's most tangible commitment to sustainability has been the introduction of long-lasting products, "attentive products", "because a durable product is a product made from premium material"; this *premium* material makes it possible to raise "the temperatures of the washings" (between 60 and 80 °C) (Zucchi M., 2023). As a result, continues Marco, "by raising the temperatures of washing, washing times are reduced and therefore pollution is reduced compared to industrial waste" (Zucchi M., 2023). "Lario Reti or Brianza Acque have embraced this project and use this durable material because, in terms of durability and in terms of sustainability, they can meet their demands" having to "stay in a range of sustainability" (Zucchi M., 2023). In addition, in Bini "we have introduced articles made with recycled plastics", which have high costs but also are "sustainable themselves because by using recycled material you can then meet the demand on welfare and sustainability" (Zucchi M., 2023). The introduction of this material made from recycled plastics was made "at the expense of two things: the cost and the colours; because using recycled products, these are going to be painted with natural dyes, (so you avoid chemicals) and hence colours are not so bright", explains Marco (Zucchi M., 2023).

In addition to this, according to Daniela, what Bini does that is important for sustainability is to propose (Mandelli D., 2023). "Bini is always looking for proposals, articles that are sustainable, materials with which to invent new products, in the transformation of products with materials that are suitable for sustainability and

therefore do not harm people's health, that do not harm the impact with the external environment" (Mandelli D., 2023). In addition, Bini is able to transmit its love for the environment and its sustainable commitment by believing in its values and the products it sells, such that Daniela says: "we too are dressed with these products because we believe in it" (Mandelli D., 2023).

From the purely practical side then, in Bini remanufactured toner cartridges are used, cartons for packaging are recycled, recycled paper is used, they are trying to switch to cardboard tape, all the company's neon lamps have been changed replacing them with halogen lamps that are less impacting on the environment, the insulating coat to the external structure was made in 2008, the boiler was changed to a higher-performance induction one, they disinfect test clothes with ozone, they have a plotter that uses eco-inks, and they care a lot about the separate collection of waste (Mandelli D., 2023) (Zucchi M., 2023). In addition, Bini is collaborating with Camera di Commercio Lecco-Como to write "the sustainability report" (Mandelli D., 2023). "We are among the 20 companies in Lombardy that have been selected to make this report. Our history also allows us to be a *credible* company", existing and operating since 1925 (Mandelli D., 2023). Finally, Manifattura Bini has just joined "a Larian network on sustainability" (Mandelli D., 2023). As Daniela explains, "we are a group of companies that interface with public administration and with the third sector. We are trying to create a supply chain to create sustainability for all, a complete line" (Mandelli D., 2023). Present as the only work clothing company, Bini will certainly benefit from this chain in terms of visibility: "they give you the opportunity to be visible in the regional context but also in the national one", says Daniela (Mandelli D., 2023). The goal of this chain, which unites both small and large companies, will be "to bring innovation or proposals to change the way of working without impacting so much", "to improve the aspects of the internal welfare" and "to have a more open culture towards people"

(Mandelli D., 2023). Many small companies, in fact, fear sustainability because of high costs, explains Daniela; however, "if you look in the future they are not costs, but savings" (Mandelli D., 2023).

On the one hand, this fact of caring about sustainability and doing everything possible to save the world began in Bini with the arrival of Daniela (Mandelli D., 2023). The owner explains her passion: "when I was little, I was in the WWF, I was already thinking about water", "I always thought that our footprint is important, at a working level, human, but also for the environment. The environment is super important to me" (Mandelli D., 2023). Daniela adds: "if it had been for me, if I had had more resources I would be completely sustainable in everything. But it takes a lot of money" (Mandelli D., 2023). Daniela's family has always been a family that cares about the environment and loves nature and country life (Mandelli D., 2023). When Daniela took over Manifattura Bini, she brought her green mentality to the whole company, finding support also from her parents (Mandelli D., 2023). "We understand the value of what we have. We don't take for granted the earth, light, air, ..." "I need contact: what the earth gives me I must give it back" (Mandelli D., 2023).

On the other hand, Marco explains that "Bini has been *concretely* committed to sustainability for two or three years now" (Zucchi M., 2023). At that moment, in fact, Manifattura Bini became aware of Blåkläder and saw in it the possibility of being able to make a change and differentiate itself from competitors (Zucchi M., 2023).

As mentioned, two or three years ago Manifattura Bini met Blåkläder for the first time; as Marco says, "it was a bit of a push for us" (Zucchi M., 2023). Blåkläder presented itself to Bini with its values and the latter, thanks to this meeting, "understood that the world was changing"; "they anticipated it" (Zucchi M., 2023). As Marco says, "the introduction of their products and their visit has allowed us to say <let's make a

change>" (Zucchi M., 2023). Bini wanted to change because "we realized, 7 years ago, that we were one of many; because people called us and told us <this is the product, make me this offer>" (Zucchi M., 2023). "But now they call you and you say <look, there is also this product>. Don't they know it? Then you go to present it, present the company, present the arguments; and then from here you understand that we 'left' the market, so as a result we have slightly anticipated what today the market asks", explains Marco (Zucchi M., 2023). A characteristic of Blåkläder, which also makes this Swedish company very competitive, is the fact that "before offering us products they gave us their philosophy", as Marco explains (Zucchi M., 2023). "We had to enter into the philosophy of Blåkläder"; "Blåkläder's philosophy was a concept that, when you listened to it, you either understood it and embraced it fully, or you said no. We embraced it because we understood that we could get out of the market, and so we embraced it willingly" (Zucchi M., 2023). Marco continues: "from here, daily, monthly courses have started, going to the headquarters of Blåkläder Italy, following web-seminars, etc., in order to deepen these topics that are very vast" (Zucchi M., 2023). Marco explains that when he presents the Blåkläder brand to his customers "I do not present only the trousers, that is to say, the logic of Blåkläder is: you ask for the appointment, you present who Blåkläder is, you present what are their main characteristics (which we have embraced), then as a result an overview; then after one or two visits, you start showing the product" (Zucchi M., 2023). This is because "if you don't understand what the concepts are, you can hardly sell a high-end product. A person must first understand the whole discourse of welfare, of sustainability, of closed cycles, etc.; because if you present only the product and you show it at a high cost, they say <no, we are used to a cheap consumer product>" (Zucchi M., 2023). Marco concludes: "here we go out with another mindset. But when you explain it well you see results" (Zucchi M., 2023).

In addition, what drives Daniela and her entire company to continually innovate towards sustainable ways of doing business is the desire to save the world (Mandelli D., 2023). Daniela reports some events in which she tried with passion to make people understand the value of a banal shirt, and also the value of the same in terms of the environment: to produce a shirt in fact 3000 litres of water are used (6000 litres for a sweatshirt, instead), from the processing of cotton, to the realisation, until when it is packaged (Mandelli D., 2023). Although there are many people who do not care about sustainability or do not understand its value and importance, Daniela carries on with conviction the idea of buying high quality and long-lasting clothes, so that we can buy less and reduce the impact of consumerism on the environment (Mandelli D., 2023). "We must find the right people and the right times" (Mandelli D., 2023).

Transition to sustainable business models

The two sustainable innovations of Bini on which this analysis focuses are the introduction of the digital printer (see [Image 3.1.2](#); shown in the end of the case study) and the realisation of garments and objects with fabrics that come from recycled plastic bottles (Mandelli D., 2023). Thinking about these two innovations, they have had (the printer) and are having (the fabric made with recycled bottles) a significant impact on the key activity of Manifattura Bini, having revolutionised the way to customise garments (Mandelli D., 2023). Marco says that now, with these innovations, "those who work in the technical department are more attentive to the needs" (Zucchi M., 2023). This is because, "raising the bar, having more demanding and more attentive customers, it is clear that we must be more careful and more aware even in production to reduce errors"; "having technologically advanced machinery, we must be careful not to consume ourselves surplus material" (Zucchi M., 2023). As a result, Bini is attentive to the results and therefore it tries to "have an optimal result with less costs and less

time, even if the products that are used are niche products" (Zucchi M., 2023). These products are in fact "paints, liquids, or inks that need to be recycled, and have their own costs. Though, everything is linked to a careful production cycle, to reduce the various wastes even on our own" (Zucchi M., 2023).

These green innovations have also impacted the customers with whom Bini interfaces (Mandelli D., 2023): "with these innovations we have expanded the number but we have also cultivated them, in the sense that our customers are turning to us also because we have these innovative technologies" explains Marco (Zucchi M., 2023). Bini, with "this innovative technology" is able, on the one hand, "to reduce the time of the job advancement process", making early deliveries to customers and shipping them quality products; and on the other hand, it can take better care of customers (Zucchi M., 2023). Marco says that with regard to the established customers of Manifattura Bini, these two innovations have allowed the company to introduce new and innovative products to customers, stimulating their curiosity and consolidating the relationship (Zucchi M., 2023). "Instead", continues Marco, "for new customer approaches, for example, we look at the internationality of customers. What you didn't do before, that is to say, before you turned to territorial customers or anyway standard customers" (Zucchi M., 2023). "With innovative products, with innovative prints, with innovation, with welfare, with well-being and with sustainability, new markets have opened to you, or you open new markets" (Zucchi M., 2023). Once you identify the possible customers with whom to interact, "you ask for a meeting, a check occurs, there is an exchange of ideas, and this helps their growth but also ours"; Bini, in fact, in addition to proposing innovative products, actually goes to see what the market asks for (Zucchi M., 2023). Instead, "before, we did not know what the market could be because we proposed it, we were innovative" (Zucchi M., 2023). "Now people are more attentive to these things, and therefore there is a greater exchange," says Marco (Zucchi M., 2023).

As for the first innovation, the purchase of the printer of the brand Epson, Bini required that it be a printer "that does not use carcinogenic or solvent substances", in fact it "uses only Epson products" and "it prints with water-colours" (Mandelli D., 2023). This new printer is "certified, it is a 4.0 machine", defines Daniela (Mandelli D., 2023). The printer "is managed by a software": by entering all the necessary data, the printer processes the information and "transforms the fabric with these materials that are not impacting" (Mandelli D., 2023). The characteristic of this machine is that "everything is sustainable": the cartridge, once emptied, is returned to the headquarters, "it is re-filled and it is returned to us full" (Mandelli D., 2023), the inks are then recycled once they are disposed of (Zucchi M., 2023). Daniela narrates again surprised: "it is a printer that you do not even feel that prints because it is silent, but then, also the smell, you do not feel the smell because there are no solvents" (Mandelli D., 2023). And the results are no less: "they are beautiful prints" (Mandelli D., 2023). Even the colours, despite being water-based, "resist anyway", "we, in the field of workwear have the same performance as before despite the garments being washed at 60 °C" (Mandelli D., 2023). Marco explains: "we decided to introduce the printer" following the market change made with the meeting with Blåkläder; the Swedish brand, in fact, "made us understand that they already customised products with innovative techniques" (Zucchi M., 2023). As a result, Bini also wanted to try to follow the imprint of Blåkläder personalising with innovative techniques: "therefore we saw what were the techniques on the market, the most appropriate for customising Blåkläder products (initially), and then we saw that these techniques could be adopted even on 'cheaper' products", explains Marco (Zucchi M., 2023). Bini's characteristic high quality standard, with the introduction of the Epson printer, was then "adopted for all customisations", "so we improved the quality of the product" (Zucchi M., 2023).

The curiosity and openness towards innovation that characterise Bini and Daniela, has meant that they became aware of the Epson printer through an industry fair (Mandelli D., 2023). Daniela explains: "I wanted to buy it but there was no possibility, and then there was not the person who was suitable to do this. But now, Pier [the operator] is very good, very flexible, he has questioned himself, he too wanted to understand the whole process" (Mandelli D., 2023). This new printer "is a filler, that is, it completes our customer service"; Daniela in fact explains that it allows Bini to better serve customers and be faster; "this printer has been very important for me because it will not only be this machine, but there will be others and more evolved. I gave this one 4 years: in 4 years I change it or insert others" (Mandelli D., 2023). From these words emerges another characteristic of Daniela: the openness towards changes and innovations, a mentality that has transmitted to the whole company and that is allowing her to carry on a reality with success (Mandelli D., 2023). "I'm glad I made this investment, it's proving me right. Before we also gave a lot of stuff out, we did not go into service so fast, we did not have the opportunity to make so many prints as differentiated in size, in colours, ... " (Mandelli D., 2023). With the new printer, Bini has improved its performance: "it is something you can do in a short time, a few pieces, excellent customer service, and sustainable because at zero cost: the material arrives here and from here it leaves. But before that, the material came here, it had to go to whoever printed it, brought it there and brought it back, then sent back. Long time, a lot of money and many means of transport. Instead, now it comes and everything is ready. A great deal" (Mandelli D., 2023).

As for the fabric made of recycled material, after discovering the existence in Italy of companies that produced this type of material, Bini has "gladly accepted the challenge of selling products that have these characteristics" (Zucchi M., 2023). Manifattura Bini, "with one of our partners, a great friend" who "makes fabric production" (one of these

few companies in Italy that produce these innovative materials), has in fact produced products "made with bottles of water from the Mediterranean and the oceans, combined with cotton", explains Daniela (Mandelli D., 2023). "They take water bottles from the sea, these are recycled, cleaned and then they are transformed into shavings, which is polyester" (Mandelli D., 2023). "The goal is to steal from the ocean the material that affects our biological environment" and use it to produce garments and gadgets (Mandelli D., 2023). Even the idea of fabric made with recycled plastic bottles came to Daniela during a fair, a small stand, which mentioned the recycling of bottles, but which did not attract anyone's attention (Mandelli D., 2023). Daniela, instead, was intrigued and from there the idea was born: Daniela, in collaboration with the stand company, commissioned them some small test creations, "we made aprons, we made some clutches, we made some pad holders" (Mandelli D., 2023). As Marco explains, "we sell these products with the customer's brand; we show the article and 99% of the time the customer is shocked because he does not know that on the market there is this product, and even more shocking is the fact that you can customise it" (Zucchi M., 2023). Despite this, the fabric still has some technical difficulties: the colours are not well defined (because, as Daniela explains, both "the quality of the bottles we are going to recover", and "the cotton that is organic, does not give uniformity to the fabric") and the material is heavy, "it is not very comfortable"; "it is a material that does not lend itself so well" (Mandelli D., 2023). Bini believes that this fabric is more suitable for making gadgets, as it tried to do (Mandelli D., 2023). Despite the difficulties currently encountered by Daniela and her collaborator, because Bini's request is that they are all natural dyes and "because the costs are very high", the owner of Bini does not lose hope: "we have many limits, but I believe in it. I think we will be able to come up with something soon" (Mandelli D., 2023).

Reasons for the transition to sustainable business models

The reason behind the decision to buy the Epson printer remains in line with Bini's values; as Daniela explains, in fact, "the printer is a service for customers", with it Bini wanted to give its customers "a product that was sustainable to the last", "we always focus on quality" (Mandelli D., 2023). As Daniela says, a product is sustainable both if it comes from organic materials, such as bamboo; and it can also be a sustainable product despite being made of polyester "if it has a life of 6/7/8 years": the garment becomes sustainable "because it has a long life" (Mandelli D., 2023).

Daniela, with the fabric made from recycled bottles, had the desire to "reuse something that would get lost", which ended up abandoned in the environment (Mandelli D., 2023). "Why use new energies, new resources, new materials when there is something that can be reused?" Daniela motivates this way the choice (Mandelli D., 2023). "I was looking for something that could be a bit like us", something to "reuse" (Mandelli D., 2023).

On the one hand Daniela explains that "our goal is that we like to leave a good mark. My grandfather left a good mark on my parents, my mother left a good mark on me, I have to leave a good mark on my son, my son will on his children" (Mandelli D., 2023). This way Daniela motivates her desire to innovate the company and continue to do better (Mandelli D., 2023).

On the other hand, Marco explains that Bini's goal is to try to "anticipate the times" of the market (Zucchi M., 2023). This is the main reason why the company tries to innovate itself, also in terms of sustainability (as it did by introducing the printer and commissioning products with recycled materials) (Zucchi M., 2023). Staying 'still' on the market means disappearing with time, while the quality of the entrepreneur is the desire to risk; as Marco says, "we have anticipated the time by risking" (Zucchi M.,

2023). Bini, in fact, has existed since 1925 and "from 1925 to today, with various introductions both generational (as for example Daniela), and innovative regarding the materials, our company is always growing; therefore, we wanted to anticipate the times because the market asked for it, and we realised with these 'top' suppliers that it was time to do something" (Zucchi M., 2023). This 'time' was 7 years ago "in quite difficult times" because of the market crisis (Zucchi M., 2023). At that time, in fact, people were still not used to talking about "recycled products or durability", which is now "essentially what the market asks for" (Zucchi M., 2023).

Changes in the company's business model resulting from external factors

Daniela believes that climate change *indirectly* impacts her company (Mandelli D., 2023). The scarcity of water, the rising cost of electricity, the lack of heat to reheat ourselves due to too high prices, the greenhouse effect, "even the land that anyway is taken away from urbanisation, even that creates a climate change that affects our company" (Mandelli D., 2023). Daniela then exposes her worries and thoughts: "to make a company work it takes many resources, and many of these are given by environmental situations. If these environmental situations change, everything is questioned" (Mandelli D., 2023).

In a direct way there are no aspects of climate change that have a very significant and continuous impact on Manifattura Bini; in fact, to operate it requires mainly electricity, and current environmental conditions do not yet hinder the production process of the company (Mandelli D., 2023) (Zucchi M., 2023).

Since Bini is not a productive company, climate change is felt by workers more as a personal issue (Mandelli D., 2023). Daniela explains: "the use of water is important for us, but we do not use it daily, except for individual needs" (Mandelli D., 2023). To avoid

negatively suffering the effects of climate change, Daniela has in mind a series of investments that she would like to implement: "for the lack of water I'm thinking of making tanks. For what concerns electricity I am thinking of making a photovoltaic or geothermal system" (Mandelli D., 2023). "Climate change is there, but I am *anticipating* it" (Mandelli D., 2023).

In a sense, all the changes made over time by Daniela have completely innovated the company (Mandelli D., 2023). Speaking specifically of the introduction of the Epson printer and the fabric made with recycled bottles, one function of the Manufacture Bini that has not undergone any changes is for example the embroidery part (Zucchi M., 2023). For this type of customization polyester products (intended as thread) that are of high quality and also recyclable are used (Zucchi M., 2023).

Daniela urges Manifattura Bini to "always look for partners and customers who understand our concepts" (Mandelli D., 2023). Bini evolves and at the same time seeks this evolution also in its customers and collaborators (Mandelli D., 2023). In fact, the latter must share the same values and ideals that Daniela and Manifattura Bini embody, as well as understand the services that Bini offers and their value (Mandelli D., 2023). "The size service is a service, the packaging is a service, the printing and embroidery of even small pieces is a service, the 'custom-made' is a service, ..." explains Daniela (Mandelli D., 2023). "Our customers must have our DNA" (Mandelli D., 2023).

The current customers of Manifattura Bini accompany the latter in a path of mutual growth, and also develop a bond of friendship (Mandelli D., 2023). Daniela takes part in walks, lunches or dinners, and moments spent with customers (Mandelli D., 2023). The owner explains the link that there is with her customers: "there is a continuous interface: I can give to you and you can give to me, even in terms of innovations for example, between us and them. Because we're always looking for something, and so

are they. So when we do something, we are happy to show them, and so are they" (Mandelli D., 2023).

Measurement of progress

Manifattura Bini does not monitor the ecological improvements it faces, due to the lack of means and resources to do so (Mandelli D., 2023). "We do not have a department that monitors and tells us what level we are reaching" (Zucchi M., 2023). As Marco narrates, when Bini makes machinery changes, the introduction of a newer and more technologically advanced machinery itself brings benefits for the company (Zucchi M., 2023). "Being a small company we touch with hand" the improvements (Zucchi M., 2023).

Bini does not have a recurring precise moment in which it defines the objectives for the future, it is not something they define 'programmable' (Mandelli D., 2023) (Zucchi M., 2023). As Daniela explains, "we take these decisions when there is a budget, I decide. Every year something new is done, but it depends on the availability we have"; "we are doing something different every year, so as to impact as little as possible" (Mandelli D., 2023). "Usually in the middle of the year we have the meeting with the accountant and it is estimated more or less if there is the possibility" (Mandelli D., 2023). Among the macro objectives, Daniela would like to realise in Bini a geothermal plant ("to lighten the costs of the company"), put the electricity columns for cars, invest in electric or hybrid vehicles (to reduce the environmental impact), invest in "other processing machinery" (Mandelli D., 2023). In addition, says Daniela, "we would like to make a partnership with those who manage water, also for its reuse: making tanks with water. And since so many of our customers are in the water context, we would like to

create a partnership in that context; in the sense of also raising people's awareness of water use" (Mandelli D., 2023).

Case study summary

Daniela Mandelli is the current CEO of Manifattura Bini; on her side there is Marco Zucchi as the commercial manager of the company. Bini is a family company launched by Daniela's grandfather, following the generations, until the current date with Daniela at the head. Among the values of Manifattura Bini, quality is the most important, but also people and the environment in which the company operates. As for these ideals, Bini chooses suppliers and partners that share the same values. The engagement of Bini for sustainability is firstly shown by the sale of long duration products, which enable the raising of temperatures of washing and the reduction of chemicals used in the latter. Besides, Bini with a partner has started producing fabric made with recycled plastic bottles. In addition to these efforts, Manifattura Bini always suggests to others their philosophy, their values, and their commitment to protecting the environment. On the practical side, the company puts efforts into recycling materials and takes on investments that little by little make Bini more sustainable. Finally, new is the collaboration of Bini with the Camera di Commercio Como-Lecco to write a sustainability report, and a participation to create a sustainable Larian network. Daniela has always shown her love for the environment and brought it to Bini when she became CEO; however, the real sustainable change in the company happened meeting Blåkläder and embracing its philosophy. This case analysis focussed on two sustainable innovations: the purchase of a digital printer and the creation of products using recycled material. Both of them impacted the production process of Bini, but they have also had an impact on the customers, by implementing new ones or strengthening the bond of existing ones; embroidery was a function of Bini that

however, remained unvaried by the sustainable innovations. Regarding the purchase of the Epson digital printing, Blåkläder gave Bini the hint to customise products with innovative techniques, therefore Daniela and her staff got to know the printer and decided to purchase it. As she said, this printer enables Bini to offer a more complete service to its customers; thanks to this investment, Manifattura Bini is now faster in shippings, higher in quality and it has greater variability of possible customisations. For what it concerns the production of fabric made from recycled material, Bini firstly got to know the producer through a trade fair. Once understood the opportunity this material holds, Bini commissioned this company to produce garments and gadgets. On the one hand, the reason behind the purchase of the Epson printer was to give customers products that are entirely sustainable, while at the same time keeping high standards of quality. On the other hand, by producing products from recycled plastic bottles, Daniela wanted to contribute to re-using resources that otherwise would get lost in the oceans. Manifattura Bini's objectives are to leave a positive image to future generations and to anticipate market's moves. Climate change has only an indirect effect on Bini: all the negative effects echo in the economy, on companies and hence on Bini. Even if climate change is not yet a threat for the company, Bini is trying to invest in solutions that will prevent the company from suffering from negative effects. Finally, based on the opportunities that Bini sees and the resources it owns, every year the company tries to improve its sustainability. However, the monitoring of results is not pursued by Manifattura Bini, and the definition of objectives is not periodical.

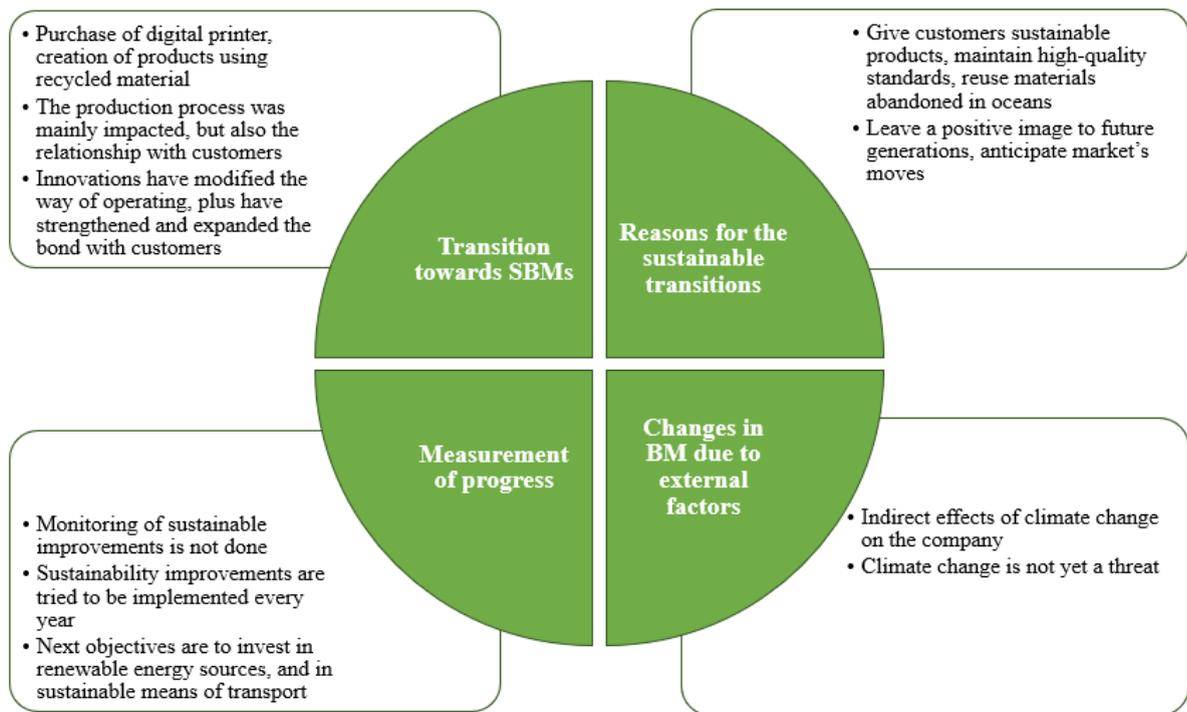
From the point of view of the author of this thesis, Bini is a small company, with sustainability in the heart. Climate change is urgently felt, and Daniela, through her company, wants to do everything possible to fight it and create a positive future for the generations to come. Although it is possible to do little at the level of sustainability in the customisation of products, Bini looks for partners and customers with the same

values of quality and sustainability, but above all, this company aims to raise awareness while always being open to innovation.

The sustainable business model framework shown in **Figure 3.1.1** helps better visualise the SBMI of Manifattura Bini.

Figure 3.1.1. SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK for *Confezioni Manifattura Bini*

SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK Confezioni Manifattura Bini



(Pivotto V., 2023)

Image 3.1.2. Epson digital printer in Confezioni Manifattura Bini.



(Pivotto V., 2023)

3.2 FIMOTEX

All information included in this case study was retrieved from Fimotex on March 29th 2023.

Description of the company

Fimotex is a small company, a family-run business with 40 employees. As Christian explains, Fimotex "handles dyeing, finishing, and processing of fabrics on behalf of third parties". Image 3.2.1 (shown in the end of the case study) shows some machines of Fimotex.

Production process

Fimotex, working on behalf of third parties, processes "fabrics from other customers" (Mottin C., 2023). These fabrics can be of many different types, as Christian explains, "depending on the intended use, which can be clothing" (such as pyjamas), "furnishings" (including "mattress covers"), "or even industrial" (Mottin C., 2023). Christian adds: "there are various types of fibres, there is a great variety: cotton, polyester, etc. Cotton, straight from cotton bales, is spun into yarn. Polyester is also spun into a single strand and then wound into yarn cones" (Mottin C., 2023).

Christian explains: "the fabric comes to us in its raw state, which can be either yarn-dyed or ready to be dyed; then, we open up the fabric for various processing" (Mottin C., 2023). First of all, "the fabric is spun into yarn, and then it's knitted on circular machines or on traditional shuttle looms" (Mottin C., 2023). Once the fabric is knitted (a process not carried out at Fimotex), "we end up with fabric in pieces" (Mottin C., 2023). "We join these pieces together, because they're usually in a tubular form, but the fabric can also be *open*, depending on the type of circular machine it's knitted on. We prepare these carts, join piece by piece, and then these carts are either dyed or sent directly to finishing, depending on the needs, the quality desired, and how much is to be spent" (Mottin C., 2023). Christian explains that "finishing processes" (i.e., "the last process done on the fabric") can be "gauze, shearing", or "dyeing, if the yarn is not already dyed or if the yarn is a combination of colored jacquard threads" (Mottin C., 2023). "From there, once the fabric is dyed and pre-treated for finishing, it is finished according to the requests": these "can be gauze, shearing, emery, or simple ironing passes" (Mottin C., 2023). Christian clarifies: "ironing is essential to bring the fabric to the height and weight per square meter required by the customer; because if you don't finish it, if you don't bring it to height as the mesh is structured, then you put it in the washing machine and it falls apart or you find that it shrinks a lot. That's why finishing is

very important, especially for enhancing fabrics that would otherwise be poor", finishing gives "a pleasing appearance to the touch" (Mottin C., 2023). In finishing, it is possible to add "a huge amount of products: antibacterials, fluorocarbons (to have that water-repellent effect), stain repellents, flame retardants (to prevent them from catching fire), ... there are several types of finishing," explains Christian (Mottin C., 2023). If the fabric has a nap ("a little dirty hair that you would find when you wear dark shirts and see the lint attached," explains Christian), it can also pass through a machine, the shearing machine, which performs shearing: "with this cleaning work, a clean effect of the fabric is achieved, sheared to prevent it from leaving hair later" (Mottin C., 2023). Christian continues: "the fabric is worked in ovens" (Mottin C., 2023). "We also have compactors to ensure greater dimensional stability of the fabric; then it is packaged in ready-to-be-laid, cut, and sewn pieces" (Mottin C., 2023). Once the fabric is packed and packaged, "it is placed on pallets and shipped to various customers who are normally the garment manufacturers, where the fabric is cut (using laser or scissors) into the shape of a garment and then sewn together, to make clothes, to make furniture, ... a hundred types of applications" (Mottin C., 2023). Christian adds: "we also heat-set the fabric on which others then laminate it with other fabrics to make gloves, helmet linings, ..." (Mottin C., 2023).

Fimotex has an "old dyeing plant" with "old dyeing machines that we use for washing at 90°C, not under pressure"; then there is another "dyeing plant where we dye and work fabrics under pressure⁹"; "under pressure, in fact, polyesters can be dyed better" (Mottin C., 2023). In the "dyeing department", the fabric, which "can be raw or also dyed in paste¹⁰", is washed "to remove all excess oils or to be dyed with a series of powder dyes", contained in a specific warehouse (Mottin C., 2023). Then there is "a

⁹ Christian explains that "under pressure" means that "the machines reach a temperature of 130°C to dye the polyesters, because they are dyed at very high temperatures"; the "steam pressure" is in fact "at 6 atm or 6 bar" and this "means 6kg of force per square centimeter over the entire surface" (Mottin C., 2023).

¹⁰ The "yarn dyed" fabric means that the yarn is already dyed, but this requires a "dyeing process to wash it and remove the oils from the machining (because when you machine, you have to lubricate the needles, and so some oil is carried inside the thread)", explains Christian (Mottin C., 2023).

continuous wash": in this phase, "the fabric enters tanks that spray, through nozzles, water with a high-temperature detergent" (60°C, 70°C, 80°C depending on the article): this serves to remove "oils from the fabric" (Mottin C., 2023).

Christian then adds: "the drainage pipes of the dyeing department are filtered through a grid; all the residues, various threads, end up in a specific container," "then we dispose of this waste with a specific CER code for the case" (Mottin C., 2023).

Furthermore, "we have an underground storage tank of one and a half million litres": in this tank "we have a million litres (1000 cubic metres) of only effluent water which is taken and oxygenated through blowers" (Mottin C., 2023). "From there, there are suction fans to remove the condensation that is created, because in any case that water is at a certain temperature that can reach even 40°C 50°C 60°C; condensation and odours are created and sucked and sent into the atmosphere" (Mottin C., 2023). Fimotex also has wells "to store water and then soften it; we have storage of cold water and storage of hot water" (Mottin C., 2023). Christian explains that both waters "are essential for dyeing: the cold water comes from the softened well water, while the hot water (in terms of sustainability) is reused at 40°C, 50°C"; the temperature of use "depends on the accumulation, how long it has been there, ..., because it comes from the smoke abatement system" (Mottin C., 2023). In fact, Fimotex's ovens release exhaust fumes, which then pass through the smoke abatement system (Mottin C., 2023). In Christian's words: "these exhaust fumes pass through electro-filters where they capture and precipitate the oils in the smoke; these are then stored and disposed of with a CER code in the form of paraffin" (Mottin C., 2023). "Water is also needed to cool these fumes because otherwise they would go into the atmosphere, and high-temperature fumes are not good for the atmosphere" (Mottin C., 2023). "So, the fumes are cooled down by the softened water and released into the atmosphere at 40°C, compared to the 200°C we would have otherwise had from the combustion

fumes" that occur in the ovens (Mottin C., 2023). "We recover this hot water and store it to be reintegrated and used in the dyeing or washing cycles" (Mottin C., 2023).

Fimotex also owns a "steam generator" (Mottin C., 2023). As Christian explains, "we need steam both to give a sort of finishing to the fabrics (giving them steam actually helps to shrink the stitches), or to exchange water with steam and bring the dyeing water to the indicated temperature for dyeing" (Mottin C., 2023). Christian then describes the smoke abatement system: "the exhaust ducts enter inside this box: you practically don't see smoke coming out"; in the absence of an abatement system, in fact, "you would see a white cloud" (Mottin C., 2023). As for the "chemical-physical purifier," Christian explains that "the accumulated water, oxygenated to facilitate its purification, passes through sand filters where the large particles are filtered; subsequently, the water passes through activated carbon filters, which are constantly recharged"; finally, "we dispose of the clean and purified water in the sewer" (Mottin C., 2023).

With purification, sludge is generated, then disposed of, which is reused "to fertilize fields because they are free of surfactants"; this sludge is also "freed from oils because it is diluted with softened water that we cannot use all of" (Mottin C., 2023).

Fimotex also has a "450 kilowatt photovoltaic system, combined with a cogeneration system" "for the production of electrical energy" (Mottin C., 2023). The cogenerator "is fueled by gas and its engine generates electricity; we then exchange the exhaust fumes from this engine with the thermal oil that is used to heat the ovens": "we heat the oil to be then used in the finishing of textiles" (Mottin C., 2023). The cogenerator "also produces hot water that circulates (at 80°C) in a closed circuit to cool the engine. Through heat exchangers, we exchange this hot water, heating other water. That is, the tap water (at 20°C) passes through these heat exchangers and exchanges with the water that is at 80°C, generating water at 60°C" (Mottin C., 2023). This is done to

"recover as many kilocalories as possible, because in any case, there is a large use of kilocalories to bring the water from 20°C to 60°C or 70°C" (Mottin C., 2023). Christian then reflects: "with sustainability, it's true that we are obliged, but the point of strength can be to **take advantage of it**: that is, still recover as many kilocalories as possible from the use of energy. And then there is also an economic saving", considering "all the kilocalories that you recover in this way, starting from the exhaust gas abatement system, from the production of electricity with cogeneration, etc..." (Mottin C., 2023).

Unfortunately, the smoke abatement system releases an oil, called "disposal oil," which "falls down from the smoke abatement system, is stored, and then disposed of" in the form of paraffin wax (Mottin C., 2023). This oil, which also contains water due to washing, "we let it settle. Then, the oil, which has a lower specific weight, goes to the surface and underneath we have the water. We remove the water and then dispose of the paraffin wax" (Mottin C., 2023).

Christian then adds: another "waste is the residue from the napping process. Napping involves the formation of dust", "napping would be to make the inside of sweatshirts" (Mottin C., 2023). In napping, "the fabric enters some sort of barrels with needles, micro needles, which pull out the fuzz from the fabric and create that woolly effect" (Mottin C., 2023). This phase "involves dust that is vacuumed up and then condensed" (Mottin C., 2023). Christian explains that this dust is condensed because otherwise "you would have huge bags of dust, but in this case we have a compactor that makes logs of dust and we can go on for 4 months filling 10 or 12 bags, which are then disposed of" (Mottin C., 2023).

Sustainable innovations

Fimotex's analysis focuses on the introduction of the smoke abatement system. Christian confirms that "the most significant project is undoubtedly that of the smoke

abatement system" (Mottin C., 2023). From the smoke abatement system (which cost €1 million), Fimotex is able to recover "hot water to be completely reused in the production cycles, because it is not contaminated by anything, it is only exchanged. The smoke passes through these heat exchangers, heats the water, and lowers the temperature of the smoke" (Mottin C., 2023).

Introduction to the interviewee

Christian Mottin, born in 1995 (Mottin C., 2023), is 28 years old. He chose to study accounting in high school and then went on to study business economics at LIUC Cattaneo University (Mottin C., 2023). After completing his studies, he joined the family business (Mottin C., 2023). He enjoys his work, although it is very demanding, but "it gives you a lot of satisfaction" (Mottin C., 2023).

Christian's role is to replace his father and uncle, the founders of Fimotex, and ensure continuity in the company (Mottin C., 2023). As the head of the company and responsible for its overall management, Christian is involved in everything "from purchasing certain goods, to managing the department, to managing customers" (Mottin C., 2023).

What satisfies Christian is that his work encompasses all aspects of the company (Mottin C., 2023). As he says, "having your own company means that you come into contact with the tax, commercial, production, relational aspects, and more" (Mottin C., 2023).

Christian argues that "every company has an environmental impact, but the skill lies in limiting this impact" (Mottin C., 2023). Fimotex is committed to sustainability by reducing emissions, purifying wastewater, self-generating electricity through cogeneration and photovoltaic panels (Mottin C., 2023).

Christian explains: "My parents and uncles have always worked with cogeneration for energy independence" in order not to suffer the negative effects of a power outage (Mottin C., 2023). This desire for energy independence, more than of sustainable origin, arose in the founders from an economic need (Mottin C., 2023). Additionally, Fimotex has sought to be sustainable since 2015 by reducing emissions with the smoke abatement; the plant was later upgraded to a more suitable one, the one currently in use (Mottin C., 2023).

Over the years, Fimotex has implemented a series of measures ("photovoltaic system, smoke abatement system, sand filter system, cogeneration system, ...") also "to have an environmental reduction, a reduction of the environmental impact of our company," says Christian (Mottin C., 2023). These investments have been costly for Fimotex: "they were demanding and had a strong impact"; "then, from here, we have seen how to use them and how to recover from these costs, such as from heating water" (Mottin C., 2023).

Transition to sustainable business models

To better understand Fimotex's business model, Christian explains that "customers are those who sell the fabric": companies that have the fabric produced and then sell it to their respective customers (Mottin C., 2023). "The sales channels through which Fimotex makes itself known are mainly word of mouth, but also the website" (Mottin C., 2023).

Focusing on Fimotex's sustainable innovation of introducing a smoke abatement system, the biggest impact that this change had on the company was with respect to production, and therefore the key activities, because a final phase was added for the treatment of exhaust fumes (Mottin C., 2023). The introduction of the smoke abatement system also impacted the company's costs because, on one hand, it was an expensive

investment and needs to be cleaned regularly, but on the other hand, it allows for savings by recovering kilocalories and hot water (Mottin C., 2023). The introduction of the smoke abatement system also had an impact on the regulatory and legal aspect because it stopped neighbourhood complaints and calls from municipal police for excessive smoke (Mottin C., 2023).

As mentioned, the introduction of the smoke abatement system has altered the production process (Mottin C., 2023). Prior to its implementation, Fimotex released exhaust fumes directly into the atmosphere, but now the abatement system treats the emissions (Mottin C., 2023). According to Christian, the emissions released into the atmosphere "are no longer at very high temperatures, we don't generate smoke, and we no longer have problems with the surrounding community" (Mottin C., 2023).

This implementation of the business model was originally driven "by regulatory requirements," but also resulted in environmental sustainability gains (Mottin C., 2023). According to Christian, **"sustainability is indeed a cost, but it is also a strength"** (Mottin C., 2023). For Fimotex, this sustainable innovation has improved its image and allowed it to "recover as much as possible, in this case as many kilocalories as possible" from the hot exhaust fumes released into the atmosphere (Mottin C., 2023).

Reasons for transitioning to sustainable business models

Fimotex's business model was innovated to become more sustainable, due to regulatory requirements and requests from the local community (Mottin C., 2023).

Christian honestly says that the reason Fimotex moved towards introducing the smoke abatement system is "because you're actually forced to: forced by regulations and then by where the company is located, by the neighbourhood" (Mottin C., 2023). Fimotex has indeed received periodic calls and complaints from nearby residents:

"from *Fimotex*, we had become *Fumotex*¹¹," Christian says angrily (Mottin C., 2023). "Because we have the company here, then houses behind us were built (in an industrial area) and then people complained about the smoke" (Mottin C., 2023). "They almost *forced* us to install this smoke abatement system," he added (Mottin C., 2023).

In addition, ARPA¹² conducts checks on Fimotex, taking measurements at the chimneys to monitor the substances released into the air in the exhaust fumes (Mottin C., 2023). Fimotex is indeed required by regulations to "emit a certain amount of NOX and therefore we have to limit its emission into the atmosphere," explains Christian (Mottin C., 2023).

With this sustainable innovation, Fimotex aimed to "achieve a positioning, even in terms of image, of a more sustainable company compared to others," says Christian (Mottin C., 2023).

The smoke abatement system allows Fimotex to heat water, reduce the temperature of exhaust fumes, eliminate the large white smoke cloud, and consequently be more environmentally sustainable (Mottin C., 2023). The water that is heated with the exhaust fumes (using a heat exchanger) is then stored, and with pumps, reused in production processes: both for washing and dyeing cycles (Mottin C., 2023).

Changes in the company's business model resulting from external factors

Christian highlights how water is fundamental and necessary for Fimotex (Mottin C., 2023). Fortunately, the geographical location of the company allows for the groundwater to be found by digging 30 metres underground, and then softened (Mottin

¹¹ The word 'fumo' in Italian means 'smoke'.

¹² "ARPA Lombardia (Regional Agency for the Protection of the Environment of Lombardy) is responsible for the prevention and protection of the environment, supporting regional and local institutions in multiple activities: from the fight against atmospheric and noise pollution to interventions for the protection of surface and groundwater, from the monitoring of electromagnetic fields to investigations on soil contamination and remediation processes" (ARPA Lombardia, 2023).

C., 2023). Christian explains that they “currently have an abundance of water, but this does not take away the fact that if there were to be an unusual period of time without precipitation, we too could have problems” (Mottin C., 2023). Therefore, the aspect of climate change that most impacts Fimotex is water scarcity, a very critical issue in Italy in the last two years, where hot and dry summers were and are still predicted (Mottin C., 2023).

Moreover, climate change has a significant impact on Fimotex's core business activity (Mottin C., 2023). Regarding water, Christian explains: "for us, water is essential to be able to dye and finish fabrics: water is a necessary resource" (Mottin C., 2023). Therefore, considering that with climate change, water may become scarce, the entire production process of Fimotex is threatened (Mottin C., 2023).

Having mainly affected only the production process, the introduction of the smoke abatement system has not, for example, modified the relationship that Fimotex has with its clients or partners, or its sales channels (Mottin C., 2023).

Measuring progress

Fimotex is not a company that monitors the environmental improvements it undergoes (Mottin C., 2023). Christian explains, "we must comply with certain parameters set by law. That is the standard to be respected" (Mottin C., 2023). The law indeed requires releasing only a certain amount of NOX into the atmosphere, whether or not an exhaust gas purifier is used (Mottin C., 2023). Fimotex's exhaust fumes have then been calibrated and regulated to comply with regional regulations (Mottin C., 2023).

"We do not periodically redefine our goals; we assess them based on our priorities at the moment" (Mottin C., 2023). If there is an investment that Fimotex would like to

undertake, being a family-run company, "if cash flows are positive, we invest based on the needs of the market and the resulting requirements," explains Christian (Mottin C., 2023).

A future project that Fimotex would like to undertake is to reuse the dirty water that currently flows into the sewer: "now we send it to the sewer, because the values are not optimal anyway"; the goal would be to purify it and reuse it in the production cycles (Mottin C., 2023). Christian says that it would be necessary to "install another set of carbon and sand columns, to soften the dirty water and obtain optimal water value parameters to be able to reuse it in the production cycles" (Mottin C., 2023).

Case study summary

Christian Mottin is the actual manager of Fimotex. The engagement of his company goes from the smoke abatement, to the waste water purification, to the auto-production of electricity. The case study analysis focussed on the sustainable transition of the introduction of the smoke abatement, which has mainly impacted the key activities of Fimotex, by adding a final phase to the production process that lowers the temperatures of the emitted smoke; the innovation also impacted the legislative aspect of Fimotex by making the company compliant with regulations. Fimotex, with this innovation, was able to improve its reputation and gain a source of heat to be implemented in the processes. To be more sustainable, to be imposed by the regulations, and to be blamed by the neighbourhood, were the reasons that pushed Fimotex to innovate the business model. Regarding climate change, the most important factor for Fimotex is water scarcity: water is indeed necessary for the company as they use it in the processes. Therefore, the function in Fimotex that is more at risk due to water scarcity is the production. The sustainable progress that Fimotex is subject to

derives from the impositions of the regulations; however if the company believes that one investment is to be made, and they own the financial means to do it, they invest with no problems. Fimotex thinks about objectives in the moment in which opportunities arise, they do not plan for the future. One desire Fimotex has is to be able to reuse the water that now is discharged into the sewer.

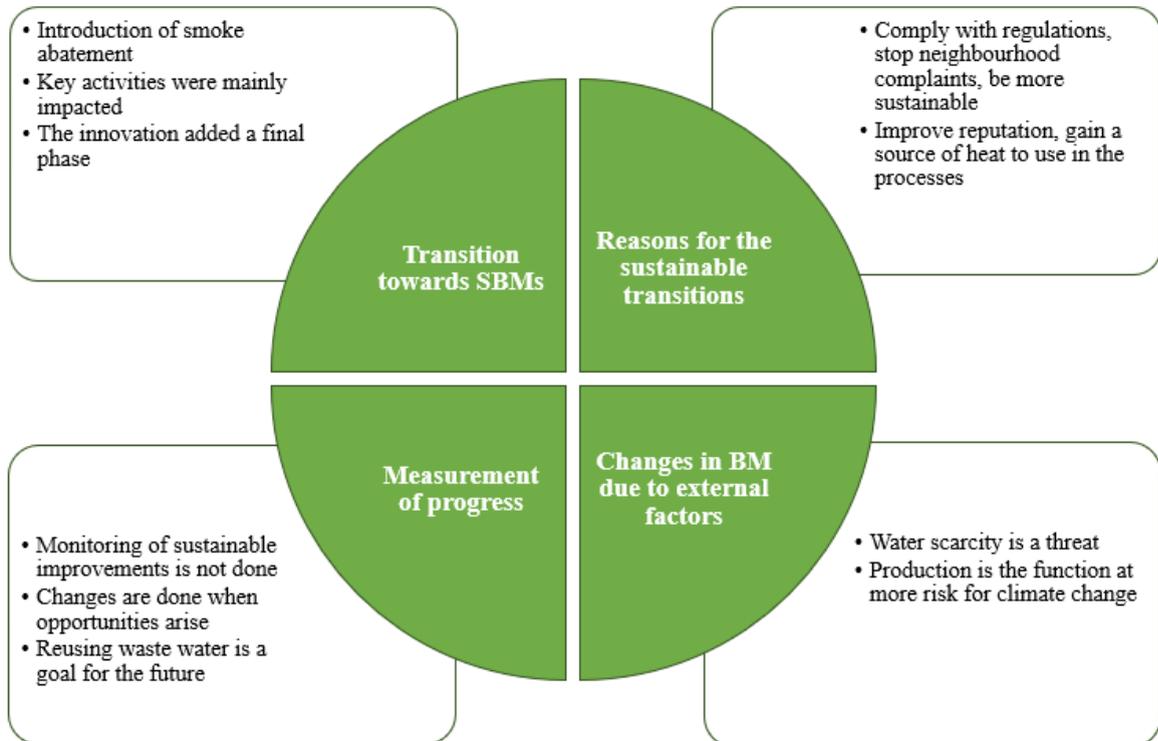
From the subjective point of view of the author of this thesis, sustainability does not shine through from the heart of the people working at Fimotex, but it is rather seen as a necessary and imposed adaptation (as it can be seen behind the reasons for the installation of the cogeneration plant). Anyhow, Fimotex does not ignore environmental issues and it tries, whenever possible, to innovate itself by finding advantages in sustainability: indeed, Christian believes that sustainability is a cost but the wises would find strengths in it.

The sustainable business model framework shown in [Figure 3.2.1](#) helps better visualise the SBMI of Fimotex.

Figure 3.2.1. SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK for Fimotex

SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK

Fimotex



(Pivotto V., 2023)



(Fimotex, 2023)

3.3 STAMPERIA OLONIA

All information included in this case study was retrieved from Stamperia Olonia on March 21st and April 4th 2023.

Description of the company

Federico presents his company as follows: "Stamperia Olonia is a printing company that mainly works on behalf of third parties. We print fabrics (primarily cotton) for use in home decor and fashion. We take care of everything from printing to finishing, which

means everything that transforms the white fabric into fabric ready to be made into clothes, sheets, or tablecloths" (Ravazzi F., 2023).

Stamperia Olonia, as Umberto explains in detail, deals with "the transformation of textiles on behalf of third parties": the raw fabric is worked on by external companies performing the "fabric preparation"; this involves "removing the weaving slivers (thus roughing it), then bleaching it and making it a print-ready product" (Cattaneo U., 2023).

"Once the product is made print-ready, we proceed to carry out the on-site dyeing of the piece" (Cattaneo U., 2023). Stamperia Olonia prints using two possible classes of dyes: pigment and reactive dyes (Cattaneo U., 2023). The fabric follows two different paths depending on the dye, "after which, the fabric undergoes a finishing process, where it is treated, brought back to its standard height and stability conditions, and given a certain hand, giving it a certain additional value, and then shipped back to customers" (Cattaneo U., 2023). [Image 3.3.1](#) (shown in the end of the case study) shows some machines of Stamperia Olonia.

Production process

Federico describes the entire process that takes place at Stamperia Olonia. "Once the fabric arrives from the customer to us, it is stored and registered with our unique codes" (Ravazzi F., 2023). "When the customer's order arrives, the fabric roll is taken" from the warehouse (Ravazzi F., 2023). There are two types of printing possible at Stamperia Olonia: "traditional printing or digital printing" (Ravazzi F., 2023). Federico continues: "for traditional printing, there are three types of identical machines that differ in the height of the fabric to be printed: the lowest one (Altaer) prints fabrics of about 150 cm, the Vega prints fabrics up to 280 cm, and the Nera prints fabrics up to 320 cm" (Ravazzi F., 2023). "Traditional printing is called *rotary* because nickel cylinders, that are engraved, are mounted, and they have micro-perforated parts" (Ravazzi F., 2023).

"The colour is pumped inside the squeegee and then comes out of the squeegee nozzles. The colour drips, and the squeegee squeezes the colour onto the rod (which is an iron bar) and makes it come out of the cylinder holes. Underneath the machine's carpet, there is a magnet that attracts the iron rod and physically squeezes it out of the cylinder holes by physical force" (Ravazzi F., 2023). "Each cylinder is a colour, and at most, we can print 15 colours. The designs are chosen by the customer because the cylinders and colours belong to them" (Ravazzi F., 2023). Federico adds: "the customer has a digital or paper image; they ask us to develop it: either they already have the cylinders made, or we help them develop the design in the cylinders; then based on the digital file or paper print, we go on to fence the colours" (Ravazzi F., 2023). In Stamperia Olonia, there is a "colour kitchen" where sampling takes place through a spectrophotometer, this system "automatically provides recipes, which are combinations of colours" (Ravazzi F., 2023). "Colours are mixtures of multiple colours and other chemical additives," explains Federico (Ravazzi F., 2023). "The software helps us by providing pre-set recipes that are sampled, and the colour tone is verified to be the one required by the customer. Otherwise, corrections are made by changing the ratios between the colour mixture" (Ravazzi F., 2023).

At Stamperia Olonia, printing is done using "two types of dyes: reactive dyes and pigment dyes. These two types differ in terms of chemistry and solidity (i.e., how they endure sunlight exposure, bleach, or high-temperature washing cycles), and the process involved is very different" (Ravazzi F., 2023).

Reactive dye, as explained by Umberto, "reacts with cellulose fibres or animal fibres (such as silk, wool, virgin milk, viscose). This type of dye requires printing (where the dye is applied), steaming (where it is fixed and reacts), and washing (where the excess is removed)" (Cattaneo U., 2023). With pigment dye printing, instead, the colour is applied to the fabric with resins; "that colour becomes solid when you make the resins

cross-link at high temperatures, which means that they condense and incorporate the pigment, giving solidity," explains Umberto (Cattaneo U., 2023).

Federico explains: "pigment dyes, after printing, are dried in the dryer (which is like an oven: with the gas burner, the fabric is dried at high temperature). For pigment dyes, catalysts and cross-linkers are added, and polymerization occurs: the colour is fixed to the fibre with polymeric chemical bonds. For reactive dyes, there is the same drying phase, but the colour does not bond as well to the fibre, and therefore requires a pass through the steaming machine (like a steam oven)" (Ravazzi F., 2023). The steaming process, explains Federico, "is an oven at 101°C saturated with steam. The steam and high temperature open the cotton fibres, and the dye chemically bonds to the fibre. In this phase, the maximum amount of reactive dye is fixed, and the excess has to be removed" (Ravazzi F., 2023). As mentioned, the process is different for the two types of dyes; after this phase, "the pigment dye is already fixed and ready for the next phases, while the reactive dye needs to be washed to remove the excess" (Ravazzi F., 2023). Federico goes on to explain that "all prints made with reactive dyes that have been steamed are passed through the washing plant" (Ravazzi F., 2023). In the washing process, "there are a series of tanks at different temperatures, some with the addition of soap, others with the addition of pH correctors" (Ravazzi F., 2023). "The fabric passes through the rollers and *goes in and out*" (Ravazzi F., 2023). "The cold and then hot temperatures are used to remove, in separate stages, some chemical substances, such as printing thickeners (which are necessary auxiliaries to fix the colour); the excess colour is removed up to the last tank where there is rinsing in cold water" (Ravazzi F., 2023). Subsequently, the fabric is taken upstairs, to the drying rooms in the attic, "where there are steam-heated cylinders, and it is dried and rewound" (Ravazzi F., 2023). At this point, Federico explains, the fabrics printed with both types of dyes "are brought together and can continue their process with finishing" (Ravazzi F., 2023).

"Finishing is the application of chemical baths to give the fabric particular characteristics", one of these is "soft hand" to "make the fabric soft" (in fact, the fabric when it comes out of printing seems like cardboard, but it already improves in texture after washing) (Ravazzi F., 2023). Federico explains: "the fabric enters, is soaked and wetted, squeezed by rubber rollers, and then passes through a part of the machine that straightens it" (Ravazzi F., 2023). Following this, the fabric enters the drying oven: this "is a gas burner that dries the fabric" (Ravazzi F., 2023). The fabric, coming out of this phase, is "very soft and with a well-defined height, because this machine allows giving it a defined height that is set" (Ravazzi F., 2023). "The fabric will have this height maintained over time even after washing. This is done for all types of fabrics that we handle: from those for shirts, where soft finishes are done; to tablecloths, where perhaps oil, water repellent, or stain-resistant treatments are done; or there are anti-peeling treatments to prevent pilling when rubbing against sheets or other clothing items," Federico explains in detail (Ravazzi F., 2023). Federico reports that in some cases, "after finishing, for home furnishings, some customers ask us for a pass in the calender. The calender is a machine in which, with a physical process, the fabric is physically crushed by a steel cylinder that can be cold or hot. This is because in the finishing bath have been put some particular resins that, under pressure or at high temperatures, give a shiny look or an even softer hand to the fabric; these are usually characteristics that have the sheets" (Ravazzi F., 2023). "It is a physical process, but it acts on chemicals that have been put on the fabric fibre" (Ravazzi F., 2023). As for the shirt, "the fabric has a defined height: that is, when it is washed it will tend not to shrink or widen in the sense of texture", explains Federico (Ravazzi F., 2023). "But it could still move in the warp direction. To avoid that a shirt at the first wash is twisted or shortened, another treatment is done with the Sanfor machine" (Ravazzi F., 2023). The latter "compacts the threads in a warp, then in length. It is not visible to the naked eye,

it is a micro-compaction that serves to give stability. To do that, the fabric comes in, it's preheated with steam, then there's a clamp that gives it a height that basically equals the one that's fixed with Ram. Then the fabric passes through rubber cylinders, where there is also the steel cylinder. With steam and humidity, with temperatures around 100°C, with this rubber ring and pressure, the fabric encounters friction and then the fibres flow in the opposite direction to the direction of sliding of the fabric, and compact" (Ravazzi F., 2023). Finally, "the fabric comes out of the cylinder, goes back into steam heated cylinders, and then for thermal effect it is fixed in that position. At this point the fabric is stable", "it should no longer move after washing, as per the label", explains Federico (Ravazzi F., 2023). After these steps, "there is the packaging part" (Ravazzi F., 2023). For this, there are different variations depending on what customers require; Federico explains: "there are customers who send us the white roller of 5000 metres and require us the same roller, all printed and finished. Other customers ask us for the packaging in rolls: from a large roll we create pallets with rolls of 50 or 100 metres. This is because then customers send these rolls to pack to make clothes or sheets, and their confectioner can not handle rolls so large, but only handles rolls. So we rewind the fabric into rolls. Or maybe customers, for economic reasons, prefer to print a very high fabric and then cut it in half: then from a print they get two finished products. Then we cut in half and roll up on two small rolls. Other customers, instead of rolls, prefer the flap: the fabric is unrolled and is folded (i.e. folded on itself) with which pallets are made" (Ravazzi F., 2023). Stamperia Olonia provides its customers with a complete service, Federico says indeed: "in the packaging phase, whether it is roll or flap, we also make a very rough control service, also because we are not a control centre¹³" (Ravazzi F., 2023). In the final stage, "the rolls or flaps are closed, packaged and

¹³ Federico explains: "the control centres are born to find the defects, therefore they have a very slow process speed of the patches, staff highly trained in researching the defects. Defects can depend on our workmanship, which can be for example a cylinder that breaks and loses colour, or a piece of scotch or fabric that goes on the incision and therefore does not allow the passage of colour, and then you'll find a print where there's a part that stays white. The control centres do a patch mapping and we do this roughly" (Ravazzi F., 2023).

stored in the automatic warehouse. On the day of the withdrawal, towards the weekend when the drivers arrive, they automatically load their goods", concludes Federico (Ravazzi F., 2023).

As mentioned, the cylinders used by Stamperia Olonia "are the property of the customer but we keep them" in an external warehouse; there is in fact the department for "cylinder management": the people employed in this department "have been formed to handle problems, so if the cylinders break or are cut, the workers can repair them as much as possible; if the damage is serious, the cylinder must be redone" (Ravazzi F., 2023).

Regarding the colours kitchen, "all the products we use, are products of companies mainly certified", explains Federico (Ravazzi F., 2023). "As a company policy we try to choose products that are safe for the environment and for our workers. It is a bit uneconomic because sometimes, with the same product, maybe a solution a little less sustainable from the environmental point of view, would cost less" (Ravazzi F., 2023). Federico then adds: "for safety choices of our operators and for cleaning environments, we do not use powder colours, but only liquid pastes and dyes (that is, already dissolved) to avoid soiling a lot and make our workers breathe the dye" (Ravazzi F., 2023). "Almost all colours are automatically dosed", "it's all automated"; "once the colour is identified for the production of a customer, this remains in a system coded with a unique code, the recipe is automatically sent to the colours kitchen" (Ravazzi F., 2023). Under the heads with colours comes a bin in which "the colours are dosed without the operator touching anything, then the bins are shaken and are labelled" (Ravazzi F., 2023). "The operator may manually add only some products that are used occasionally. This allows us to have good reproducibility because it is a machine that doses with a balance and modulated valves. And then it allows us to avoid a

continuous contact with chemicals by our operators", explains Federico (Ravazzi F., 2023).

As regards the products, "all the products you see around are products of certified companies and, for the type of products we make (products for clothing or home), most foreign customers require us to meet international standards of product quality and safety, which are for example Oeko-Tex. We are Oeko-Tex class 1 and 2 (class 1 is for fabrics that are used for children under 36 months; class 2 is for fabrics in contact with the skin)" (Ravazzi F., 2023).

For these international standards, Federico says, "there are technical requirements, such as the solidity of colours in light, in washings, in saliva; then there is also a maximum content of dangerous substances" (Ravazzi F., 2023). "We can therefore only use certified and tested products", explains Federico (Ravazzi F., 2023). Precisely for the Oeko-Tex certification, Stamperia Olonia is subject every year to "chemical controls of the finished product"; and "every two years, an inspector comes to check the traceability" (Ravazzi F., 2023). Stamperia Olonia for traceability is very efficient: as Federico says, "for each piece of finished product coming out of our warehouse, we can trace how many grams of a chemical product have been used and which batch. We can also trace the machine settings, the operator and the day they were made. So we need to ensure this traceability to have total control of our process. The same policy applies to finishing products: they are dosed, in the same way automatically, and in the same way are certified products" (Ravazzi F., 2023). Federico then adds: "Another standard that we follow internationally is Gots¹⁴; Gots is a certification that only concerns organic cotton" (Ravazzi F., 2023). This certification, for Stamperia Olonia, does not concern the origin of the fabric "because it is purchased by the customer"; however, every customer who supplies Gots to Stamperia Olonia must first inform the company of this particularity, then Stamperia Olonia, in the processing of this fabric, will

¹⁴ Global Organic Textile Standard (Gots).

have to pay much attention "such that this fabric never comes into contact with any fabric other than Gots, and for those productions specific products are used that are listed in a list that is continually updated by certification bodies. And these products are tested directly by the chemical manufacturer", explains Federico (Ravazzi F., 2023). "So when I have to buy a dye, if I know I need it to make Gots productions, I have to ask my supplier for a dye that is Gots certified, otherwise I can't use that dye" (Ravazzi F., 2023). To simplify this process and "to have more control", Stamperia Olonia has introduced a system with "an upstream (automatic) database" whereby "operators cannot choose unauthorised products for these certifications" (Ravazzi F., 2023).

As for the machines that Stamperia Olonia owns, Federico says: "for digital printing, we have two types of machines, one is the MS Lario which is a very high-performance digital printing machine, because it is very similar to rotary printing machines. It has 10 heads, each head is a colour and, as for cylinders, they will each make a pattern of a drawing. Thanks to this configuration very similar to a rotary printer, it also has very high production speeds, such as rotary printers. The advantage over rotary machines is that for rotary machines, when you decide to start printing, you must first mount the cylinders", then "mount the *racla*, put the rod, and bring the colour" (Ravazzi F., 2023). "However, the cylinders must be put in relation, that is, align them so that the motifs that make up the drawing are printed correctly, and the colour does not overlap"; for this small phase about 20 metres of fabric are always thrown away (Ravazzi F., 2023). "After that, you start printing; once the printing is done, you have to disassemble all the cylinders, wash the cylinders, and in the meantime you will bring new cylinders to make a new drawing" (Ravazzi F., 2023). All this process, with digital printing, is not done because it is enough to start the machine and "from the first centimetre is good fabric ready to be printed" (Ravazzi F., 2023). "And if you want to print another variant or

another design, load it with another design without a downtime and, once the drawing is finished, another one begins" (Ravazzi F., 2023). Digital printing, says Federico, "is much more productive, you have much less fabric waste, much less downtime, and you need less staff" (Ravazzi F., 2023). In contrast, however, "the digital machine costs more at the application level and therefore with regard to colouring liquids we only print reactive dyes here, so everything that is pigment we can not do here" (Ravazzi F., 2023). In addition, "digital printing has an extra process: in traditional printing, the fabric arrives from the customer ready to be used and printed; in digital printing it must first be pre-treated" (Ravazzi F., 2023). The fabric "therefore, must pass into the *ramose*, that is, the machines that serve to finish the fabric, which also serve to make a pre-treatment. These machines impregnate the fabric with all the chemicals needed to fix the ink on the fabric. The fabric is then impregnated and dried, is then printed, dried and when it arrives in the vapour machine, the chemicals that were introduced at the beginning and the dye, are fixed; this is the extra step" (Ravazzi F., 2023). Federico concludes: "So the cost is greater because you are faster, you have less waste, but you have an extra passage in the machine" (Ravazzi F., 2023). Another difference, more aesthetic, of the two types of printing is "the passage": "in rotary printing, there is a physical process of squeezing, the weight of the rod that acts on the fabric allows the passage of colour even inside the fibre. Instead, digital is a superficial print, only on the surface, if you turn it is very white" (Ravazzi F., 2023). Finally, in digital printing "there are limits: we can print 20 metres, 30 metres; digital is convenient on very low sizes" (Ravazzi F., 2023). In the rotary printing "instead, you do not print 20 metres, because it takes 20 metres just to align the fabric, therefore this printing is used for large sizes, because on large sizes it is cheaper" (Ravazzi F., 2023). In addition to the MS Lario, in Stamperia Olonia "other four digital printing machines are present that have a completely different technology, they use the same inks, they can be used indifferently

but it is a different technology that makes them less performing", says Federico (Ravazzi F., 2023). For these machines, "the principle is like the Lario: the fabric must be pre-treated; but they work in a very similar way to home printers, where there is the head that moves in the sense of texture and prints all the colours together; then according to the quality that one wants to achieve, the machine can do two or four steps on the same part of fabric to get the desired effect; and the printing is much slower because it must wait for the passage of the head" (Ravazzi F., 2023). In digital printing "there is no receiving of colours; it is all software. The software automatically decomposes the customer image and reworks it on the basis of the colours that we have, always the same ones, there are 8 colours; the software reworks it so that the print head reproduces the same image" (Ravazzi F., 2023). "Then once it is printed, vaporised, washed, it is verified if the production or the sample made corresponds with the reality, otherwise adjustments are made" (Ravazzi F., 2023).

Introduction to the interviewees

Umberto Cattaneo has been working in Stamperia Olonia since 1992 (Cattaneo U., 2023). He started working on the sampling, then directing the colours kitchen; for 15 years he has been supervisor of the colours kitchen and also environmental prosecutor supervisor (Cattaneo U., 2023). Initially he followed the first two certifications of Stamperia Olonia, the ISO 9000 and the ISO 14000 (Cattaneo U., 2023). Its role over the years has remained the same, but it has been implemented thanks to new technologies (Cattaneo U., 2023). As Umberto explains, in Stamperia Olonia "we try to keep up to date" (Cattaneo U., 2023).

Federico Ravazzi is the supervisor of the certifications: "quality, environment, safety, ISO 9001, 14001, 45001"; in addition, as Federico explains, he is the supervisor of "all product certifications, therefore mainly related to the chemical safety of products (which

for us are the fabrics we sell to our customers)"; "I also have the responsibility of safety manager, so the RSPP" (Ravazzi F., 2023). The certifications of Stamperia Olonia "in recent years have also had a social and environmental cut", as a result, Federico deals "also with all the environmental and social safety related to all these certified productions" (Ravazzi F., 2023). In addition, "since September 2022 I am also carrying out the task of deputy director of production, in the perspective that the current director will retire", says Federico; then, with the transition to production director, he will delegate to others the part of the certifications and of the safety (Ravazzi F., 2023).

Umberto finds his work satisfactory because it is a "very varied" work, "always stimulating" (Cattaneo U., 2023). His role requires interfacing and discussing with many people; as Umberto says, "the power to confront with suppliers who are able to propose new techniques, or to help you solve a problem; because in textiles there is no rule: every day you do the same things but there is always something different" (Cattaneo U., 2023). In more detail, "it is always a dynamic job, it is not a stationary job", "it is also a desk job, but especially a department job: seeing problems, trying to solve them, maybe anticipating them ..." (Cattaneo U., 2023).

Federico is satisfied with every aspect of his work, he finds it satisfying to work in Stamperia Olonia: "it is a good company with decent professional prospects, and with a good margin of growth also in the company" (Ravazzi F., 2023).

Umberto, on the one hand, says that Stamperia Olonia is committed to sustainability by using first of all recovery products, both for purification and for packaging (Cattaneo U., 2023). In addition, carefully dividing waste and classifying it in more than 30 categories, Stamperia Olonia tries to recover and recycle as much as possible (Cattaneo U., 2023): "so paper, plastic, cardboard, glass, iron, nickel (which is that of

cylinders), ..." (Ravazzi F., 2023). The company then demonstrates its commitment to the environment having taken part in a study project on how to recover textile fibres and give them a second use (Cattaneo U., 2023). The difficulties of improvement, however, are many: as Umberto explains, "the only thing we can do is to use products that already come from recovery", "we can facilitate the recovery of waste" "rather than propose ourself to recover our waste" (Cattaneo U., 2023).

Federico (Ravazzi F., 2023), on the other hand, reports another aspect of the sustainability of Stamperia Olonia. "Being a company certified ISO 14000 for several years, we have a good accounting of energy consumption and water resources"; "every year we set ourselves targets to try to reduce energy and water consumption; we do this by trying to reduce consumption and, for the water part, where possible we re-insert purified water in the production cycle" (Ravazzi F., 2023). "We, being connected only to the purifier (we have no wells), we try to optimise water resources (which is drinking water) and try to optimise consumption" (Ravazzi F., 2023). "As for the sustainable part" of Stamperia Olonia, Federico explains, "as company policy we make a selection of chemicals so that they have the least impact on the environment and safety, thus for workers. This is at the expense, sometimes, of the price. But precisely because of company policy, this allows us to have a truly good environmental impact on emissions and waste" (Ravazzi F., 2023). Federico also explains that Stamperia Olonia has revised the "standard dryer drying settings" "by also inserting automations, so at each machine downtime the dryer reduces the flow of methane gas, reduces ventilation, to try to maintain the temperature without preventing the chimney from throwing out clean hot air. At each machine stop, automatically, there is this switch that allows you to reduce both the consumption of electricity, because the exhaust reduces the flow", both to reduce the methane flow, consuming less (Ravazzi F., 2023). "As for colours", says Federico (Ravazzi F., 2023), "through a program, the leftovers of

colour of our productions are stored in stock for a maximum of 5 days; our colour receiving software knows that there are in stock those colours, so it starts from those bases to create others". "If we cannot use them, those dyes are stored in a tank, which is periodically emptied by a company that has a purifier and uses our printing pastes and our dyes as food for its sewage sludge" (Ravazzi F., 2023). Finally, "from an energy point of view, we have now put photovoltaic panels", reports Federico (Ravazzi F., 2023). The idea of this photovoltaic system was of the managing director; Federico explains: "it does not change us in terms of energy impact; but it allows us to save 10%" (Ravazzi F., 2023).

Sustainability¹⁵ has always been taken into consideration by Stamperia Olonia: "we have always been attentive to this aspect, both on the part of the old owner of Stamperia Olonia (who is now the CEO) and also on my part, on behalf of my collaborators, on behalf of everyone", says Umberto (Cattaneo U., 2023). This is shown by the fact that Stamperia Olonia was perhaps one of the first companies "to use products for formaldehyde-free pigment printing" (Cattaneo U., 2023).

Federico agrees with Umberto and adds: "the CEO, when there was still no sustainability or attention to energy saving, he since the '90s had already begun to include in the machines of our plants, inverters to optimise the consumption of electricity" (Ravazzi F., 2023). "It was still not convenient but by choice it had already been done; and then for the rest, he has always been particularly sensitive to the energy part of consumption, therefore the optimization of consumption and the environmental part" (Ravazzi F., 2023).

Transition to sustainable business models

¹⁵ Umberto explains the concept of sustainability: "sustainability can be: use less water for your work cycles, produce less CO2, order more products at the same time in order to limit the number of trips, buy products not in drums but in tanks in order to limit packaging" (Cattaneo U., 2023).

The analysis of Stamperia Olonia focuses on two sustainable innovations: the first is the lowering of the temperatures of the dryer to 30°C, reducing the emissions and eliminating a machine; the second, the introduction of a second purifier. Both innovations had an impact on the production process of Stamperia Olonia, going to change the key activities: for the first change, a phase was removed, for the second, the process was only modified (Cattaneo U., 2023) (Ravazzi F., 2023).

In particular, with regard to the first innovation, the operators of the Stamperia Olonia machines were impacted by the lowering of the temperatures of the dryers because, as reported by Umberto (Cattaneo U., 2023), the operators "had, for example, to lower temperatures, they had to follow new operating instructions, they used less water to wash the plants". The lowering of the temperatures of the dryer has also indirectly impacted the relationship with customers and partners of the company because, as Umberto explains, "actually it allowed to eliminate a machine, which was polymerization, and instead of polymerization it was put an additional spray, so as to be able to meet the demand for reactive printing" (Cattaneo U., 2023). This change, "from the point of view of the relationship with our customers, has allowed us to have shorter delivery times", but also to be able to expand the range of customers thanks to the increase of reactive printing¹⁶ (Cattaneo U., 2023). With this innovation, Stamperia Olonia has ensured that the finished product kept "the same requirements and characteristics" as before the change (Ravazzi F., 2023). Stamperia Olonia has decided to eliminate the polymer machine, a choice that is not "advantageous for the company because it is less economical, but this decision has not affected customers: we have not increased the price lists after this innovation" (Cattaneo U., 2023). This innovation also affected the commercial part of the company "because delivery times

¹⁶ Reactive dye printing is in fact "a more noble print and is economically more profitable than a pigment print" (Cattaneo U., 2023).

have changed and therefore the amount of work that can be managed", explains Umberto (Cattaneo U., 2023).

Following the introduction of the second purifier, Federico explains that "the only indirect impact that production could have is that every chemical we replace or introduce, we do it according to its depurability" (Ravazzi F., 2023). As a result, Stamperia Olonia buys only products that can be managed in its purification process: "if we cannot manage it at discharge, we cannot buy it" (Ravazzi F., 2023). Moreover, Umberto reports that, on the one hand, the introduction of a second purifier, in addition to having had an influence on the production process, has also impacted the legislative aspect (Cattaneo U., 2023). In fact, Umberto explains: "we had to ask for new limits regarding discharges and supply; so we made a substantial addition to our authorization because everything (emissions, discharges, noise, ...) falls under a single authorisation issued to us by the Province" (Cattaneo U., 2023).

On the other hand, Federico (Ravazzi F., 2023) explains that, with this innovation, apart from the production activity, "the area that had the greatest impact" was the environment. In fact, with this change, Stamperia Olonia wanted to make sure "that the industrial exhaust always complied with the tabbed levels" (Ravazzi F., 2023). "The purifier for us is an auxiliary system, we only need it to allow us to drain into the sewer. The purifier was added only to have a better quality of the discharged wastewater", explains Federico (Ravazzi F., 2023).

The lowering of the temperatures of the dryers has changed the printing cycle that has passed from "*printing and polymerization*" to "a single printing cycle" capable of giving "the same qualities of rubbing, washing and resistance to colour applied on cotton" (Cattaneo U., 2023). This is possible because "while the colour is inserted,

these catalysts¹⁷ are also inserted" (Cattaneo U., 2023). In more detail, before the removal of the polymer machine, the fabric was printed, dried, polymerized ("the fabric was processed at high temperatures, that is, polymerization occurred"), and then "went to the finishing department" (Ravazzi F., 2023). As a result of the innovation, however, "leaving the printing machine, the fabric is not only dried but is already polymerized and then it goes directly into finishing" (Ravazzi F., 2023). This change has been positive for Stamperia Olonia, as confirmed by Federico (Ravazzi F., 2023): "we have gained because there is one less machine step and therefore we have also reduced the processing time".

To reduce the temperature of the dryer, being the temperature lower than before, Stamperia Olonia had to use "more performing products" (Cattaneo U., 2023), that is "catalysts and resins, which cross-link at low temperatures" (Ravazzi F., 2023).

Umberto explains in detail what has been done: "in the pigment print, we have eliminated the binder, which is a resin used to fix the pigment that you generate to the fibre of the fabric on which it is applied. We had replaced this resin with a newly developed resin, capable of reticulating, condensing, so making stable film fixed in time at lower temperatures than the previous one. At the same time, we also used catalysts, which are difficult substances to use because they are very reactive. We created these recipes and replaced them" (Cattaneo U., 2023).

Federico adds other details to the decision-making and operational process to realise this innovation: following assessments for the environment, for safety for users, and for purification, "new chemicals" have been replaced or introduced "in the production process" of Stamperia Olonia (Ravazzi F., 2023). As Federico says, "it was established that at the environmental, safety and purification level everything was in

¹⁷ "During the mixing phase, the printing paste is already made with new binder, which is softer and lattice at lower temperatures"; Olonia Printing however has provided in the dosing software "the possibility to leave an incomplete bin with the printing paste, and complete it when this bin goes into printing to be applied on the fabric"; "so you can put this resin, this catalyst, which is very reactive and has a very short cross-linking time" (Cattaneo U., 2023).

compliance, tests were made first in the laboratory, then industrial tests to verify that the performance of the finished products are comparable to those with the traditional cycle. Once temperatures and chemical dosing had been developed, the old plant was put into disuse; after about a year of inactivity, it was completely uninstalled and then removed" (Ravazzi F., 2023).

A procedure similar to that of the tests in order to lower the temperatures of the dryers has happened also for introducing and installing the second purifier (Ravazzi F., 2023). As Federico explains, "we sampled at various points. Our sewage treatment plant is very complex, so we tried to map all sources of pollution" (Ravazzi F., 2023). Before, with a single purifier, "all the departments discharged into a tank, and from there all that mixed water was purified" (Ravazzi F., 2023). Stamperia Olonia then "intercepted all the waters of the various departments, found what was the most critical, we tried to purify it separately, and we saw that we could get excellent results using fewer chemicals for purification" (Ravazzi F., 2023). "By separating the waste water, we were able to reduce the amount of chemicals to be used to purify it, and we also had a better quality of purified water" (Ravazzi F., 2023). "Small tests were carried out in the laboratory, then the new treatment plant was industrialised and then built and now it reflects what we had planned. The waters now no longer flow in the same tank but in two separate tanks, they have two identical parallel processes, and then are reunited in the drain" (Ravazzi F., 2023).

A project that Stamperia Olonia would like to realise in the future is to "integrate the possibility of water recovery, even on machines: a long work, because the water ring in the company provides only, for now, those waters that come from the aqueduct"; "it must be implemented" by building "plants to bring water out of the purifier to the machines" (Cattaneo U., 2023). Stamperia Olonia would therefore like to recover part

of this water: "recover it all to be able to have a closed cycle is not possible, let's say that having a 10% of recovery water" would already be a good amount "considering that on average we unload 180 or 200 thousand cubic metres per year; it means not to unload 18 thousand, which is not little" (Cattaneo U., 2023).

Reasons for the transition to sustainable business models

Stamperia Olonia has chosen to "lower the temperatures of dryers and printing machines" because this leads to "a reduction in energy consumption, therefore also a reduction in costs" (Ravazzi F., 2023). The objective for which the temperatures of the dryers were lowered was "to lower the consumption and the operating costs of the plant" (Ravazzi F., 2023). Federico explains: "we had not set ourselves a specific target to reach, but we knew fundamentally that completely removing a plant the impact would be important" (Ravazzi F., 2023). In fact, by removing a machine (polymerization), introducing new products ("such as catalysts and resins"), and then "polymerizing directly in printing presses", it has enabled the staff of Stamperia Olonia "to be faster (because we have one machine pass less), less maintenance (because we have one system less)" and therefore, "this also allowed us to reduce methane consumption", explains Federico (Ravazzi F., 2023). "While before, the dryer was only used to dry, now while drying it polymerizes"; "the temperatures are not so much higher than the standard production" and so you have "polymerization almost at no cost, you only have the cost of the catalyst or of the resin that lattice" (Ravazzi F., 2023).

Federico tells how the idea of lowering the temperatures of the dryers was born (Ravazzi F., 2023). "We as a company, the head of the colours kitchen and the finisher, are always very attentive to the novelties of the chemical market" (Ravazzi F., 2023). "Many loyal chemical suppliers offer us new products" or "use us as testers: they give

us products, they tell us <try to use it for a while, then give me feedback>", finally they "adjust their recipes according to our requests" (Ravazzi F., 2023). Other companies "instead, already have products that are on the market" and "propose them to us" (Ravazzi F., 2023). Federico defines this relationship as a "*give-and-take*: they have the advantage of using us as a test and we have the opportunity to know new products that can allow us to obtain special effects, or more performing products, or can simply allow us to reduce production times or consumption in production" (Ravazzi F., 2023). Therefore, the idea of using these catalysts came from products that Stamperia Olonia has tried through these suppliers (Ravazzi F., 2023).

Umberto describes better how the discovery happened. The initial input to lower the temperature of the dryers came from Arcroma, a supplier of Stamperia Olonia and part of the Basp group (leading producers of acrylic resins) (Cattaneo U., 2023). Umberto explains: "they have proposed us this new type of resin because we have always worked a lot with them", "already when I started working here, our owner had already opted to order products that release less VOCs, that is, less volatile organic substances in the air, therefore very ecological fumes" (Cattaneo U., 2023). Constantly looking for "products with fewer volatile organic substances", Stamperia Olonia took the opportunity when Arcroma proposed them to collaborate for the study of this resin (Cattaneo U., 2023). "We did several tests, we did samples, we did productions replacing the old binder with the new, we did all the tests of solidity and rubbing; in the end we put them into production" (Cattaneo U., 2023). The entire test process lasted between 3 and 4 months due to the need to verify both "the impact on water", and whether the goods with the new product were compliant with customer requirements (Cattaneo U., 2023). Once all these aspects have been verified and approved, Stamperia Olonia has introduced this new resin in production (Cattaneo U., 2023). Umberto remembers those moments with these words: "when we went into production

we opted precisely to diversify production, then increase the reactives by eliminating a machine, and make the investment of the vapour" (Cattaneo U., 2023).

In reactive printing, in fact, reactive dyes are used (that is, they react with the fibre); when they are applied they need to undergo a passage in the vapour (Cattaneo U., 2023). As Umberto explains, "the vapour is a machine in which the fabric is put in contact for a certain period of time with steam"; the vapour has a temperature of 101°C "to ensure that it does not create water droplets" (Cattaneo U., 2023). In this way, the reactive dye reacts with the fibre and it is therefore very solid when washed (Cattaneo U., 2023). Once the fabric is vaporised, it must also be washed to "remove all the part that is not fixed to the colour"; this means that the use of water for reactive printing is significantly higher than the amount of water used for pigment printing (Cattaneo U., 2023). "The investment of the spray was therefore a related choice: the reagents consume much more water", therefore, explains Umberto, "the purifier we had before was no longer enough to purify all the water that came from washing and printing"; this is also due to the increase in Stamperia Olonia of digital printing, which, "unlike traditional printing, brings with it many more pollutants" (Cattaneo U., 2023).

These pollutants "derive from the preparation of the tissue that we make, and from the dyes that are applied and that are difficult to purify compared to traditional" (Cattaneo U., 2023). As a result, Stamperia Olonia was forced to "request a new authorization because we had to expand the purifier"; it took three years to pass "from diversification from reactive pigment to new purifier" (Cattaneo U., 2023). Umberto explains: "one thing brought the other. It was a rather logical thing, in the sense that we already thought that by increasing the reactives, the purification discourse should also increase" (Cattaneo U., 2023). In addition, producing more with digital printing, says Umberto, "we were faced with a problem of purification" because this type of printing requires urea, a substance "very difficult to purify because it brings so much nitrogen"

and "the discharge limit into water is relatively low. In order to purify urea we need a purifier that is biological, but we have a purifier that is chemical" (Cattaneo U., 2023). As a result, Stamperia Olonia decided to install a biological purifier based on biorollers (Cattaneo U., 2023). "The biorollers are rollers mounted inside a box that continue to spin: one part is immersed and one part takes air", describes Umberto (Cattaneo U., 2023). The biorollers, wetting and drying, allow the growth of the bacterial flora that "is able to decompose the nitrogenous substances and therefore urea; it is also able to decompose organic substances such as aldehydes, such as surfactants" (Cattaneo U., 2023). The biorollers were not enough to purify the coloured water, so "we had to put a chemical purifier like our pre-existing, but smaller, in order to work in a more concentrated way", says Umberto (Cattaneo U., 2023). The production process, with the introduction of the new purifier and biorollers is as follows: "the water that comes from washing fabrics treated with both digital and traditional reactive dyes, enters the washing"; the washing, explains Umberto, is "a rather long machine in which the fabric enters: the first tanks are the dirtiest ones in which the dye is released, and most of the pollutants are released" (Cattaneo U., 2023). Stamperia Olonia purifies the first tanks separately from the next ones, which contain much cleaner water (Cattaneo U., 2023). "The water of the first two tanks, which are those with the most concentrated water and where the bulk is removed", and the most polluted water of other production processes (which are the most critical waters, as Federico explains (Ravazzi F., 2023)) "flows into a vessel, which will then pump water to the new sewage plant (which is the small one, but very concentrated)" (Cattaneo U., 2023). Water, therefore, passes through this chemical-physical purifier and then in the biological one (biorollers) to complete the purification and "eliminate ammonia" (Cattaneo U., 2023). The water from the other washing tanks is combined "with the water coming from the printing department" and flows into the existing purification plant (Cattaneo U., 2023). The water coming out of

the pre-existing purifier contains low levels of COD, ammonia, surfactants, and pollutants; it is therefore usable for "washing machines"; "it is recovered for washing bins and for producing lime latex" (Cattaneo U., 2023). As Federico adds, currently these cleaner waters "are already used for rinsing, for the first washes. The idea, however, is to re-insert it in the production process" (Ravazzi F., 2023).

In fact, by introducing a second purifier, Stamperia Olonia had the opportunity to have two different water drains, one cleaner than the other; with this step the company looks forward: "we are already ready to make the new step" (Cattaneo U., 2023), "the possibility of separating the two waters, obtaining two wastes with a good pollution level quality, gives us the opportunity to reason and hypothesise further purification steps to try to recover these waters" (Ravazzi F., 2023). Federico adds: "now the next goal is" precisely to "improve the purification of one of the two fractions, the least polluted, and try to re-insert it in the production cycle" (Ravazzi F., 2023). "If we had implemented only the enlarged purifier, we would have had water still possible to be discharged as in the table but difficult to reuse. In this way, however, we have two waters to discharge: one to be discharged in table A, almost as if it could be discharged into the river; the other to be discharged into the sewer"; "the first is so much and so clean that at this point we could really return easier to recover it" (Cattaneo U., 2023).

Federico explains: Stamperia Olonia did not have "a target goal" to reach with the introduction of the new purifier (Ravazzi F., 2023). "It is not easy to say <I should reduce the level of my pollutants>. We wanted to make this change and see if there was an improvement at least in the consumption of chemicals" (Ravazzi F., 2023).

Federico admits in fact that the purifier has always been for Stamperia Olonia almost a critical point (Ravazzi F., 2023). This is because the company is subject "to controls by public bodies and the operator of the sewerage system", in addition Stamperia Olonia pays "a fee that is increased according to how much the water" that

the company discharges "is polluted" (Ravazzi F., 2023). The objective of Stamperia Olonia is therefore always to "reduce the environmental impact, the costs, and also to be sure that in the phase of checks of the bodies there are no non-compliance" (Ravazzi F., 2023). In fact, in case of non-compliance, Federico explains, "there would be, in addition to the financial part, also criminal penalties for environmental liability" (Ravazzi F., 2023). As a result, Stamperia Olonia always tries to "have a low level of pollutants to be safe", because, says Federico, the company in some years had certain "pollutants that were very close to the legal limit for the discharge: it took very little to exceed it and then be non-compliant" (Ravazzi F., 2023). Trying to stay in "a comfort zone" is therefore a goal to be continuously pursued, to avoid that "any fluctuations in the flow of production will lead to exceeding the limits", reports Federico (Ravazzi F., 2023).

The goal for which Stamperia Olonia always tries to innovate itself, is also to "look for new customers": "diversify our market, from a qualitative, economic and commercial point of view", as Umberto states (Cattaneo U., 2023). Other goals that Stamperia Olonia imposes itself are environmental: "reduce emissions", have "increasingly cleaner fumes" even without a smoke abatement, "diversify production with reagents", "have a cleaner water to reuse", recover 10% of the water, "align us to single specification of chemicals" the ZDHC¹⁸, get 100% of ZDHC certified products¹⁹ ... (Cattaneo U., 2023) Despite the ambitious goals, in practice it is increasingly difficult:

¹⁸ As Umberto explains, "ZDHC is a product certificate, which certifies a product according to a guideline that has been written by big brands and Greenpeace" (Cattaneo U., 2023).

¹⁹ Following a Greenpeace campaign, some companies decided to draw up a specification, called Detox, which certifies that certain products do not contain pollutants (Cattaneo U., 2023). Detox from specification (initially) has grown so much that it now becomes a kind of guideline (Cattaneo U., 2023). The ZDHC certificate allows you to recognize products that do not contain "chemicals that can release pollutants in contact with the skin", that "do not contain chemicals that are released in the discharges", that "contain chemicals that are not dangerous for those who use them" (such as, for example, the chemist who must apply it, who must handle it)", explains Umberto (Cattaneo U., 2023). In this regard, "we have made the choice to reach 95-98% of products certified in this way. And even now we are trying to complete this certification and get 100%" (Cattaneo U., 2023).

"the only choice that must be made is to use certified products, with low environmental impact", explains Umberto (Cattaneo U., 2023).

In addition, Stamperia Olonia, with its periodic sustainable innovations, always tries to anticipate changes in both the market and those related to the environment (Cattaneo U., 2023). As Umberto explains, "the fact that we installed the photovoltaic, that we bought a heat exchanger, that we reduced the emissions of the boiler, already brings us in the condition of being ready one day when there will still be a further reduction. Because at that point, what there will be to do will be little: you will already have ideas on what to do"; "at least you have already done the big one" (Cattaneo U., 2023).

The two innovations, on which this analysis is based, have reached or have allowed to implement part of the objectives of Stamperia Olonia (Cattaneo U., 2023). The company's staff is very satisfied with this result: "every year there is something we can do even more" regarding these objectives (Cattaneo U., 2023).

Changes in the company's business model resulting from external factors

According to Federico, no aspect of climate change directly impacts the company: "directly, apart from natural disasters I would say nothing" (Ravazzi F., 2023).

According to Umberto, instead, water has a significant impact on Stamperia Olonia (Cattaneo U., 2023). Because of the climate changes and the periods of water scarcity that Italy is facing in recent years, Stamperia Olonia is trying as much as possible to reduce "water consumption", as reported by Umberto (Cattaneo U., 2023). Reducing the use of water in the company is an important step because, as Umberto explains, "we use water everywhere": "to wash plants, to wash fabrics, for finishing baths, ..." (Cattaneo U., 2023). "The thing we can do is reduce the amount" of water used "by optimising the production cycle", "recover what can be recovered to reduce what is

discharged", "and take less of it because you recover that water you have purified" (Cattaneo U., 2023). On his side, Federico says: "to date there has never been a demand for a reduction in consumption; but we always have the goal of reducing it" (Ravazzi F., 2023). Since Stamperia Olonia does not have its own well from which to take water, the company is forced to use drinking water: "the idea of using drinking water for industrial purposes ethically is not the best, but we have no other choice because we do not have the opportunity to build a private well" (Ravazzi F., 2023). "Therefore, having to consume drinking water for industrial purposes, we try to reduce it as much as possible and recycle it as much as possible", "this is a goal that we set ourselves every year, and every year we try to do something to reduce it" (Ravazzi F., 2023).

As for the reduction of Stamperia Olonia's CO₂ impact on the environment, the company introduced a second heat exchanger "that is able to use the heat contained in the exhaust fumes (and then dispersed in the environment) and still use it to heat water", explains Umberto (Cattaneo U., 2023). "At this point from the fumes that are about 110°C, we brought them to fumes at 40°C" (Cattaneo U., 2023). To produce steam, in fact, Olonia is equipped with a steam generator; the latter "is a large boiler that heats water volumes (about 5000 litres per hour) and makes them evaporate. The amount of methane needed is a lot" (Cattaneo U., 2023). By introducing this exchanger, explains Umberto, Stamperia Olonia has been able to use less methane, reduce CO₂ emissions and emit exhaust smoke "at much lower temperatures" (Cattaneo U., 2023).

In addition, Stamperia Olonia, as far as possible, tries to protect itself from extreme weather events that can threaten the company (Cattaneo U., 2023). "In 2015 there was a big hail storm that caused some incredible damage to the company. It filled the channels of the *scrummatori*, it filled the pluvials, and therefore the water overflowed

inside the company going to wet the machinery, the electric panels, the fabrics, ..." (Cattaneo U., 2023). Following this event, Stamperia Olonia has installed "internal covers" building "an attic in critical points"; this to prevent any future damage and the consequent "costs to wash", not to have to then "consume energy to fix something: from fabrics to lines", says Umberto (Cattaneo U., 2023).

As for the rising temperatures, Federico explains that "it is more an discomfort for workers. The only air-conditioned rooms are the offices, and the departments are not"; consequently, the workers of the departments "suffer a lot from the heat of summer" (Ravazzi F., 2023). To combat the rise in temperatures, especially in the summer season, Federico says: "last year we managed to manage it, but if a torrid summer were to recur again, earlier or longer, we will have to implement the choices of having to anticipate or postpone the entry and the end hours of the workers, so that they work in the freshest hours" of the day (Ravazzi F., 2023). This would be in the interest of the workers "and for safety, that is, for their discomfort and for a security issue", explains Federico (Ravazzi F., 2023).

According to Federico, "all the production departments" of Stamperia Olonia are influenced by climate change (Ravazzi F., 2023). In the company, in fact, explains Umberto, "the operators involved are all, they are all sensitised" (Cattaneo U., 2023).

Following the introduction of the second purifier and the lowering of the temperatures of the dryers, a function of Stamperia Olonia that has not been impacted or has been little affected is, for example, the packaging (Cattaneo U., 2023). The packaging, Umberto explains, "is the final part of the production process in which you check the fabric before sending it to the customer, and you ship it in the conditions that the customer requires: i.e. in rolls, folded in the flap on the pallets, ..." (Cattaneo U.,

2023). Instead, regarding the colours kitchen (for printing) and the kitchen finishing (for finishing), "departments in which the chemistry that is applied to the fabric is produced", the workers were not affected by the two innovations, even if in reality "the coding of the various products" has been changed (Cattaneo U., 2023). As Umberto explains, those who work in the colours kitchen and in the finishing kitchen "basically suffered less, because it was a management job to change the recipes" (Cattaneo U., 2023).

Measurement of progress

In general, Stamperia Olonia constantly monitors the consumption of methane, electricity and water: "to date, almost all machines have metres" (Cattaneo U., 2023). To monitor the various consumptions of Stamperia Olonia, Federico says: "we have a fairly complex excel file, in which we enter monthly daily data of all electrical consumption, all water consumption, all gas consumption, waste production, production data, divided by machines and divided by department. We do all our statistics and then they are always compared with at least the previous three years" (Ravazzi F., 2023). As a result of these analyses, "we set ourselves objectives, these are the macro objectives, therefore general. Then there are perhaps some targeted objectives, such as, for example, the replacement of a small machine": "we decide whether to replace it", then, if the dedicated team considers that the most important part is, for example, water consumption, "the last months of work of this machine we put a litre counter on it, we count how many litres it consumes, we make a study to design the new one; or, if it already exists on the market, we ask the manufacturer what are the technical data of the machine and evaluate the impact it could have. And then once installed, we verify if there was actually that reduction in consumption that we expected", explains Federico (Ravazzi F., 2023). Despite constant monitoring, for Stamperia Olonia it is not always easy to reduce consumption every year "because this work of optimising consumption

has always been done from the beginning; so the margin for improvement is now really low. You have the big improvement when you replace something. So, to date, optimizations on production lines can be made on individual processes", explains Federico (Ravazzi F., 2023). Despite constant monitoring, even measuring improvements is not easy (Cattaneo U., 2023). Stamperia Olonia, in fact, monitors how many kilowatts it earns thanks to "a heat exchanger that we have on the washing line where we wash the pieces with reactive dyes", "it is an almost 90% yield", reports proud Umberto (Cattaneo U., 2023). "Practically the first two basins of the washing are of cold water, all the other basins (third, fourth and fifth) are water at the boiling point, that is hot water, at 95°C" (Cattaneo U., 2023). The dirty hot water after washing "is discharged continuously: the clean water upstream is discharged downstream. It is a water at 95°C, which is not thrown into the purifier at that temperature, but passes through a heat exchanger" that heats the water that must enter the wash (Cattaneo U., 2023). In the exchanger "hot water enters already at 95°C and cold water also enters; cold water heats up with a yield of 95% and comes out a water that is about 80°C and then goes into washing" (Cattaneo U., 2023). This water, at 80°C is "heated with steam", produced by the boiler, until it is brought to 95°C (Cattaneo U., 2023). This performance is monitored by Stamperia Olonia, however, as reported by Umberto, "you can not" say how many kilowatts have been earned "compared to the previous year" (Cattaneo U., 2023). "Surely we have kilowatts that are saved", which "are produced not with raw materials, but with energy sources that are: hot water (heat exchanger), the new heat exchanger for boiler fumes", "and a small solar plant to produce hot water used within the department" (Cattaneo U., 2023). In the first 3 months of 2023, "we saved about 3700 kilowatts, it is not much but still it is methane consumed less", reports Umberto (Cattaneo U., 2023).

Regarding the sustainable innovations analysed in this thesis, the monitoring of improvements is also difficult to estimate (Cattaneo U., 2023). "It's hard to tell if we've had a match for what could be a minor use of methane because we've lowered the temperatures in the attic. Certainly, by decreasing the temperature of the attics, we have had a greater use of the steam generator, which also consumes methane", explains Umberto in detail (Cattaneo U., 2023).

Regarding the monitoring itself, Federico explains: "monitoring is possible by choice, in the sense that all the latest machines installed (I mean in the last 2 or 3 years) are installed with already the metering of energy and water consumption" (Ravazzi F., 2023). For older machines, however, Federico in 2021 "followed the installation of an energy consumption management system": "with an external company we installed metres on almost all production lines. First we did an energy analysis of the company, then we evaluated which were the most expensive production lines or departments: we started from those in putting the metres. Then we re-performed all the accounts" going to check "if the metres reflected reality", in case they did not reflect it, "we went into even more detail: therefore, instead of putting the metre only at the entrance of the department, it was placed on individual lines. Now we have practically mapped 90% of the production lines at the electrical level. At the gas level we do not have such a point mapping, but we have mapped by department" (Ravazzi F., 2023). With such precise monitoring, Stamperia Olonia has "a data return that can be used to program interventions to eventually optimise consumption" (Ravazzi F., 2023).

Installing a photovoltaic system recently, Umberto explains: "we will see this year the monitoring of electricity consumption" (Cattaneo U., 2023). "This year we will use less energy because we have put in photovoltaics; that too is something we are monitoring. It's a 400 kilowatt system, and it's definitely less power or less electricity that we're

going to buy. The less electricity we go to buy will be less electricity that was produced" (Cattaneo U., 2023).

Umberto then tells of another aspect that Stamperia Olonia will soon be able to measure: "from this year, which came into operation that further exchanger on the boiler and steam generator, you can see how much methane it takes to evaporate 1 cubic metre of water"; "with that we will be able to monitor how much we went back of that investment" (Cattaneo U., 2023).

Umberto then adds: "as for the water discharges, we are quantifying how much water we are going to recover. But to this day we quantify it, we keep it aside as data and as our little pride. But the data is still little. It is a basis for the future. Now, in percentage it could be 1%" (Cattaneo U., 2023).

Every year Stamperia Olonia carries out an examination to define the objectives to be pursued the following year (Cattaneo U., 2023). Umberto explains: "we always give ourselves an idea of what we must do and we try to complete it. What is not completed is repeated the following year" (Cattaneo U., 2023). The annual objectives are "quite feasible, in the sense of tangible; they are rather limited objectives, but always maintained, always pursued" (Cattaneo U., 2023). "This drafting of objectives is done during the review stages. The review is the moment in which all data of the previous year is evaluated"; "we try, with graphs, to make it readable" (Cattaneo U., 2023). On this basis then "we think about what could be done the following year. Every year technologies are proposed that can help us in this sense" (Cattaneo U., 2023).

Federico confirms the fact that the targets are re-defined every year and adds: "they are mainly replacements of obsolete machinery or machinery that have problems. Then they are replaced with new generation ones that are more performing, both in terms of production and environmental impact and therefore of consumption" (Ravazzi F., 2023).

"In recent years they have all been replacements, but in some cases machines are introduced to expand the fleet to ensure a better service", as for example it was for the inclusion of "digital printing machines" (Ravazzi F., 2023).

Regarding the ZDHC certificate, Stamperia Olonia performs two analyses per year "to certify that our water discharges are compliant", "to be compliant as regards the sewage sludge that is sent to landfills", ... (Cattaneo U., 2023) The company is motivated to keep track of the results for the ZDHC certificate because "once you know you are certified, even customers see that you are certified and come more willingly to you", says Umberto (Cattaneo U., 2023).

Umberto then explains in more detail the decision-making process: "when you want to achieve something you say <how can I do it?> <we could do this> then we meet and discuss; everyone gives their idea of what they can do and what could be done, and we try to study it" (Cattaneo U., 2023). "Then we decide on the steps" to do and if they are feasible they are executed, otherwise, if they are "too complicated or too expensive, they are not pursued" (Cattaneo U., 2023).

What objectives to achieve in a given year are choices that are taken "from an economic, technical", "commercial" point of view; they are evaluated if they are "economically sustainable" objectives, if they can actually be achieved, if they are "technically feasible" thanks to the "know-how of the company" ("because you must have the knowledge and the education") (Cattaneo U., 2023). In addition, the requirements of "new regulations" may be added to the list, requiring the company to reduce a certain amount, for example (Cattaneo U., 2023).

Case study summary

The analysis of Stamperia Olonia included the interviews to Federico Ravazzi, the certifications and safety officer, and to Umberto Cattaneo, the environmental

prosecutor. The company since the beginning has been keen on sustainability; its engagement is demonstrated by the recycling of used materials and colours, the participation in sustainable projects, the consumption monitoring and the consumption optimisation, the reduction of the energy used during downtime, and the installation of solar panels. The two sustainable innovations analysed in the case study are the lowering of the temperatures of the dryers, and the introduction of a second purifier. Both these changes heavily impacted the processes of Stamperia Olonia, by deleting one phase (the lowering of the temperatures of the dryers) and by altering the process (the introduction of the second purifier). In addition, the innovations had an indirect influence on several other aspects of the business model of the company, as for instance customers, partners, the commercial function, the legislative and the environmental aspects. For the lowering of the temperatures of the dryers, Stamperia Olonia removed a machine and consequently it had to use new resins and catalysts, which are introduced in the production process at the same time as when the fabric is coloured. Regarding the introduction of the second purifier, before installing it, Stamperia Olonia tested a separate purification of the water originating from particular departments, the company then discovered that this separation would bring them benefits. One goal for the future for Stamperia Olonia, is to be able to recover part of the used water. The main reason for which the company opted to lower the temperatures of the dryers is because Stamperia Olonia aimed at a reduction in consumption and in costs, something that was actually obtained with the sustainable innovation. Stamperia Olonia, to reach this objective took the chance to try and test new resins sponsored by a partner company, therefore it has to be said that the original input to change was given to Stamperia Olonia by this partner. Having introduced these new resins and catalysts, and having intensified the digital printing, the purifier Stamperia Olonia had was no longer sufficient to purify all the dirty water. As a

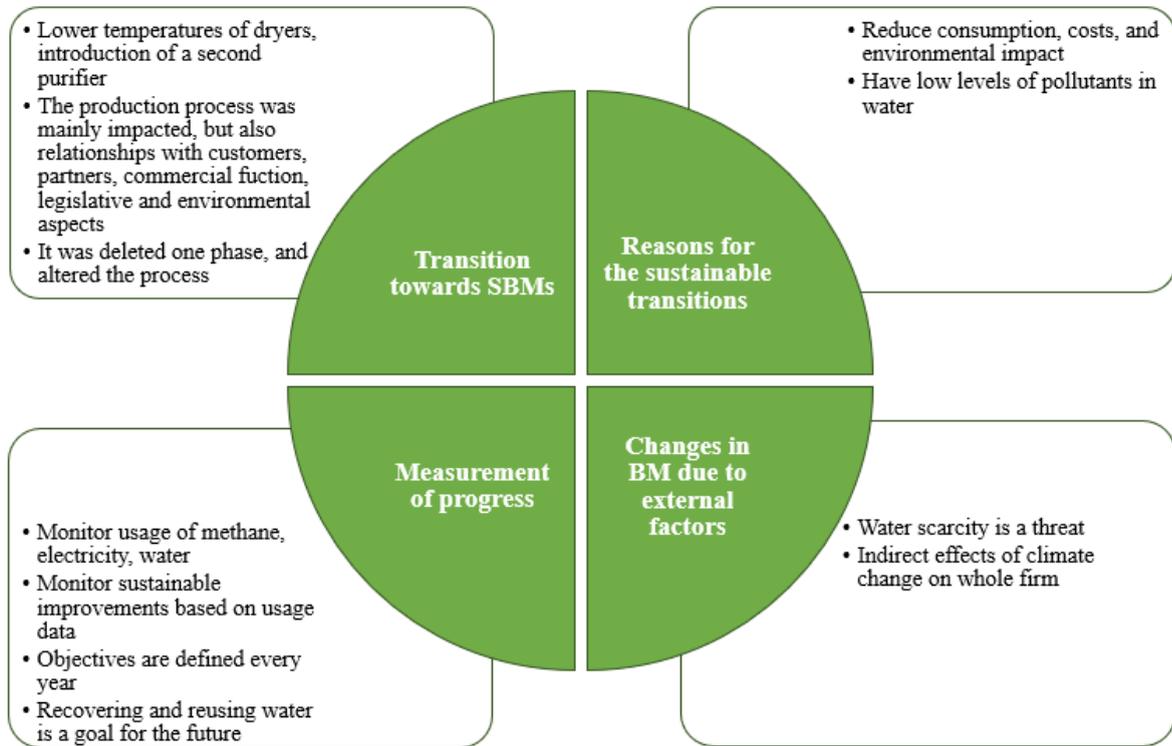
consequence, the company had to think about installing a second purifier. With the two purifiers, Stamperia Olonia has now two flows of dirty water, with different levels of cleanness, ready to re-use one of them in the future. Again, the reason behind the installation of the second purifier was to reduce the environmental impact and the costs of Stamperia Olonia, and to have a low level of pollutants in the water. Regarding climate change, Stamperia Olonia feels the threat of water scarcity. Water is employed everywhere in the production process, therefore Stamperia Olonia is trying to reduce its consumption and recover it as much as possible. In addition, all functions in the company are sensitive to climate change. Stamperia Olonia is a company that is very attentive to the usage of methane, electricity and water, indeed, the company actively and continuously monitors the consumption. People working in Stamperia Olonia, on the basis of what it depletes, they collect and analyse data and then formulate future objectives to accomplish. Other than monitoring consumption, Stamperia Olonia, whenever possible, tries to monitor the improvements. Regarding the objectives, these are defined every year and workers try to complete them within the period. The future objectives should be reachable in the allotted time, plus, they have to be economically, commercially, technically, practically and legally feasible.

The author of this thesis personally notes that Stamperia Olonia is a company that since the beginning has made choices in favour of sustainability, sometimes even if they were not affordable. It is a certified company, which always tries to improve and reduce as much as possible the consumption of water, gas and electricity. Federico is very serious and involved in his work, while Umberto has a sensitive soul that makes him suitable for the position he holds. The importance of sustainability shines through more as a company policy, rather than from the heart of people. Nevertheless, Stamperia Olonia and all its workers are constantly committed to being more ecological.

The sustainable business model framework shown in **Figure 3.3.1** helps better visualise the SBMI of Stamperia Olonia.

Figure 3.3.1. SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK for Stamperia Olonia

SUSTAINABLE BUSINESS MODEL INNOVATION FRAMEWORK Stamperia Olonia



(Pivotto V., 2023)

Image 3.3.1. Operating machines in Stamperia Olonia.



(Stamperia Olonia, 2023)

As previously announced, in the next Chapter, the comparison and consequent cross-analysis of these three case studies are provided, together with a final discussion of this thesis and the conclusion.

VII. CHAPTER 4: FINDINGS, DISCUSSION,

CONCLUSION

4.1 Cross-analysis of the multiple case study

This sub-chapter aims at reporting cross-analysed results by investigating the multiple case study and answering the research question of this thesis.

Before starting with the proper discussion, it is to be noted, however, that the three companies interviewed, Confezioni Manifattura Bini, Fimotex, and Stamperia Olonia, are three *similar* companies in the manufacturing sector in the Lombardy region in Italy. Even though they belong to the same industry, they differ in their main activities: Stamperia Olonia prints fabrics, Fimotex dyes and finishes fabrics, while Confezioni Manifattura Bini customises garments and gadgets. These activities are all part of the long textile manufacturing process that goes from the treatment of fabric to its customisation and packaging. In addition, another relevant difference is that Fimotex and Manifattura Bini are small family companies (with up to 50 employees) (OECD, 2017), while Stamperia Olonia is a medium enterprise (with 50 to 200 employees) (LinkedIn, 2023) and not conducted by family members. Moreover, the people interviewed have different roles in the companies: it was interviewed the CEOs of Manifattura Bini and of Fimotex, the commercial manager of Bini, the environmental prosecutor supervisor of Stamperia Olonia, and the supervisor of certifications and safety manager of the same company. The variety of jobs enables readers of this thesis to have a broader understanding and point of view on sustainable innovations in the textile manufacturing sector.

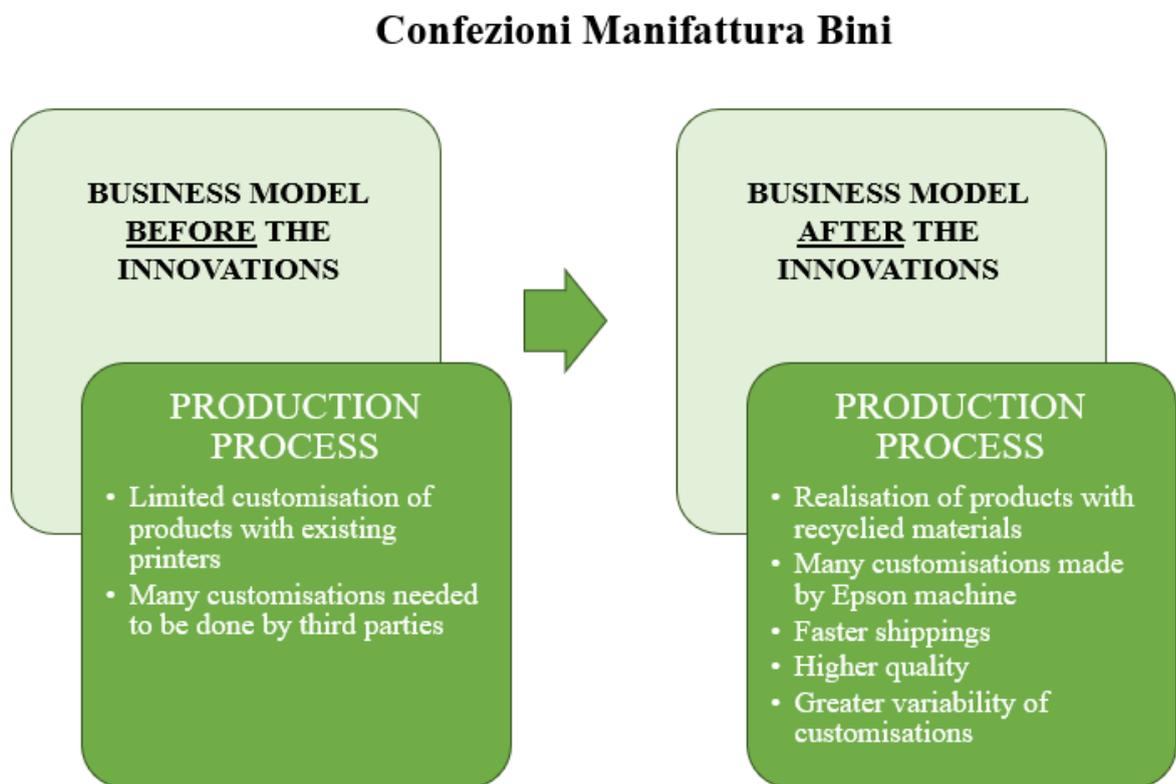
From the case studies it is possible to retrieve answers for the research question.

Firstly, as it can be seen in [Figure 4.1.1](#), [Figure 4.1.2](#), and [Figure 4.1.3](#), the three case studies focus on diverse sustainable innovations; however, all the latter have primarily impacted the **key activities** of the companies, and to a lesser extent even other functions, such as the relationship with customers and partners (for Bini and Stamperia Olonia), the legislative and environmental aspects (for Stamperia Olonia and Fimotex), the commercial part (for Stamperia Olonia and Bini). As a consequence, since the most impacted were the key activities, the author of this thesis decided to summarise in [Figure 4.1.1](#), [Figure 4.1.2](#), and [Figure 4.1.3](#) only the changes in the production processes of the firms. The sustainable innovations under study were relevant for the three enterprises and significantly altered their way of operating. In Manifattura Bini the purchase of the digital printer and the creation of products using recycled materials have modified the way of operating because they enabled the firm to more professionally customise garments and expand their portfolio of products. In Fimotex, the installation of the smoke abatement has added a final phase to the production process, that treats emissions, lowering their temperatures, before being released into the atmosphere. In Stamperia Olonia the lowering of the temperatures of the dryers has deleted one phase, by enabling the enterprise to print and polymerize in the same machine, plus, the introduction of a second purifier has altered the production process because the original single flow of water was separated into two flows that go into the two purifiers. This proves that all these changes have innovated the business models of the selected enterprises, transforming their BMs into more sustainable ones.

Therefore, this analysis of the multiple case study suggests that in many cases, in the manufacturing industry in Lombardy, the sustainable innovations of companies will occur around the key activities. Especially in the manufacturing sector, this implies that the production processes will be subject to changes being the most characteristic function of this type of firms. In addition, it is impossible to say whether phases will be,

most commonly, deleted, added, or altered, because, as it was seen in the case of the three enterprises under study, none of the three options was more prevalent than the others.

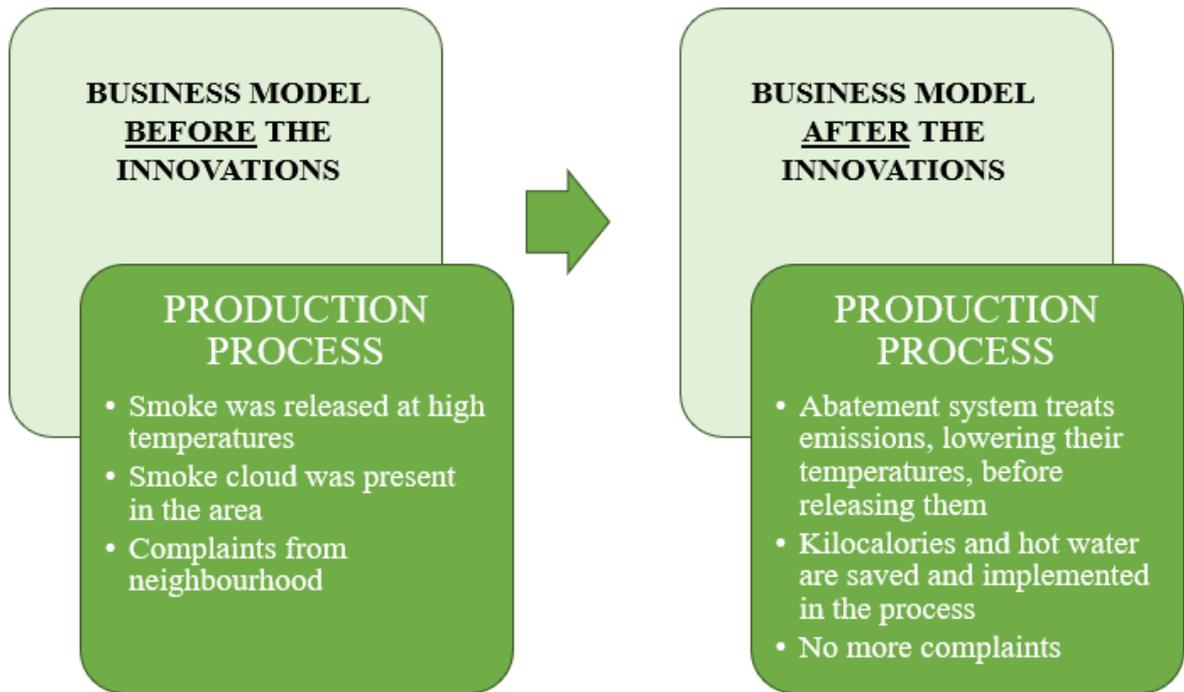
Figure 4.1.1. *The business model of Confezioni Manifattura Bini before and after the innovations.*



(Pivotto V., 2023)

Figure 4.1.2. *The business model of Fimotex before and after the innovations.*

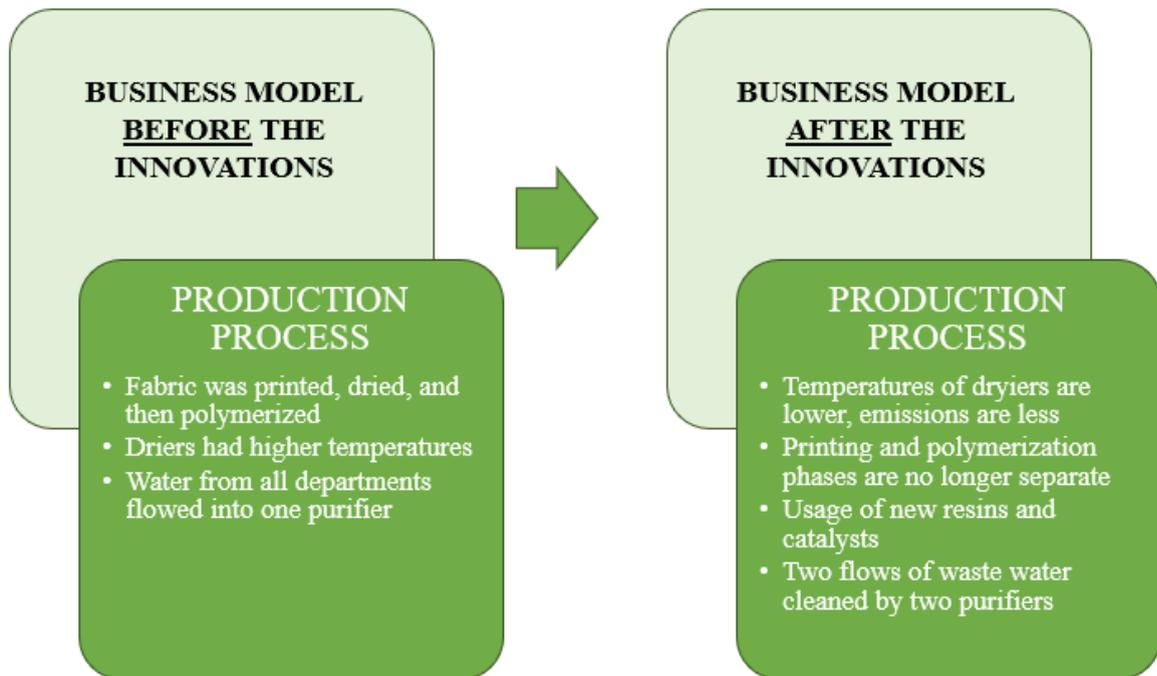
Fimotex



(Pivotto V., 2023)

Figure 4.1.3. The business model of Stamperia Olonia before and after the innovations.

Stamperia Olonia



(Pivotto V., 2023)

Secondly, if the extent to which the three firms transitioned to more sustainable BMs can be similar (they all concentrated their innovations mainly on the production process), the **reasons** behind the willingness of innovating the BMs to become more sustainable are different for every company. Confezioni Manifattura Bini aimed at maintaining high-quality standards, offering sustainable products, reusing materials abandoned in the oceans, and anticipating the market's moves. Fimotex aimed at improving its reputation, reducing the blaming, and complying with the regulations. Stamperia Olonia had the goal of reducing consumption, costs, the environmental footprint, and having cleaner waste water. As it can be seen, reasons for SMB innovations are very different from one firm to another, and can hardly be grouped together. However, what can be inferred is that **sustainability** assumes the form of the means through which companies reach their goals. Manifattura Bini, for example, by

commissioning products made with recycled materials expanded their offer to customers, but at the same time, the company gives a positive contribution to the environment. Fimotex, by installing the smoke abatement in order to stop blaming and comply with regulations, also became more sustainable releasing in the atmosphere smoke at lower temperatures. Stamperia Olonia, by introducing the second purifier in order to not be fined for excessive pollution in the waste water, became *greener* as now it has two flows of water that are cleaner and more prone to be released in the sewer.

It is clear that all three enterprises aim at becoming more sustainable in the future, however, in the present moment this objective remains very abstract, and firms' necessities deal first with other current-specific goals.

Thirdly, despite only Stamperia Olonia, out of the three companies, monitors progress, the multiple case study analysis highlights the relevance of this practice. Not only Stamperia Olonia showed the importance of **monitoring** the usage of methane, electricity, and water, which enables them to keep track of consumption and eventually act to reduce it, but the firm also demonstrated that monitoring the sustainable improvements that companies go through is essential to evaluate the implemented changes, the undertaken investments, and measure the reached progress. In addition, the multiple case study demonstrates that it is best to regularly define the next goals, as Stamperia Olonia does by meeting with the staff every year and deciding the objectives to pursue. This practice allows firms to have a clearer vision for the future, it can spur employees in doing their best to reach objectives, and it enables the enterprises to implement change in a more effective way. Periodically defining goals is possible for Stamperia Olonia because it is a medium enterprise and has more resources at its disposal, compared to Fimotex and Manifattura Bini, which both only invest when have the resources, and think about objectives, not on a regular basis, but

only when opportunities occur. This suggests that it might be common for small companies, in the manufacturing industry in Lombardy, to not monitor consumption and progress, however, this practice would be of great help in effectively carrying on sustainable BM innovations, due to the benefits just mentioned.

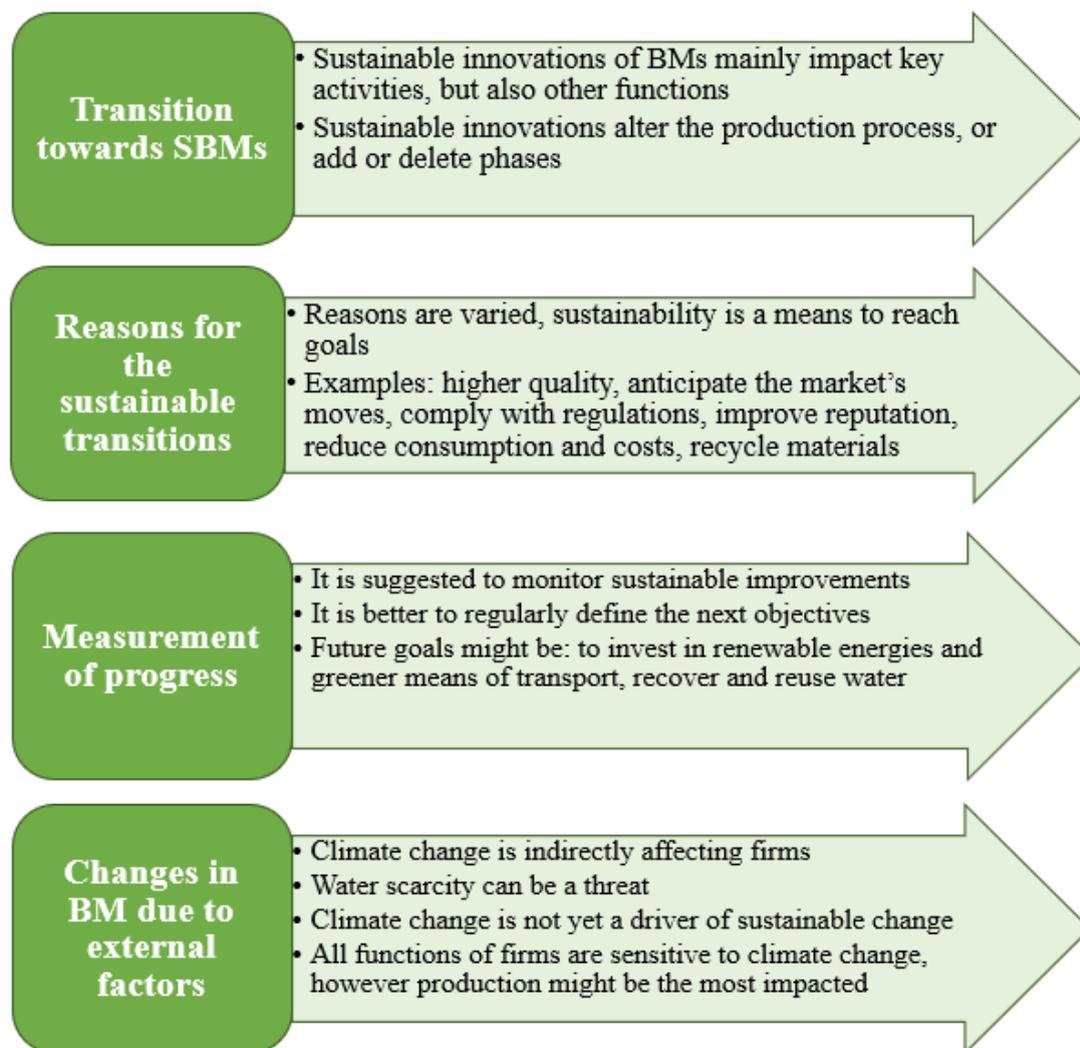
Regarding the **future macro objectives**, both Fimotex and Stamperia Olonia would like to be able to re-use part of the water employed in the production processes: by doing this, the environment would benefit as there would be less waste of water and the latter would be used more consciously. By contrast, not using as much water, Bini in the future would like to install a solar or geothermal system, invest in sustainable means of transport, and leave a positive image. These objectives, again, support the idea that sustainability is a goal envisioned by companies to be reached in the future, even if at the present moment, it is used as a tool to first achieve other goals, which may be considered more urgent by firms.

Fourthly, from the multiple case study emerges that **climate change** is not (to date) a driver for the three companies to innovate their business models sustainably; indeed, climate change did not appear in the list of reasons for which the enterprises carried on the green transitions. However, water scarcity proved to be a threat both for Stamperia Olonia and Fimotex as their production processes strictly depend on water; as a consequence, both companies are trying to reduce water consumption, using it more consciously, and aiming at re-implementing it in the production cycles. Additionally, the world is subject to the negative effects of climate change, therefore the latter impact and disrupt the world economy, and, as a consequence of these dynamic market forces, all firms and, specifically for this case, the three analysed companies are indirectly subject to global warming's negative externalities. Plus, among all functions of firms, the production process is likely to be the one affected the most by climate

change's consequences, as it is demonstrated by the cases of Stamperia Olonia and Fimotex. In fact, for example, Stamperia Olonia was subject to an extreme event of climate change, a strong hail storm, that damaged many machines causing stress on production. All this shows that, overall, companies belonging to the manufacturing industry in the Lombardy region in Italy, might show the same pattern, that is to say, these firms are not yet pushed to innovate themselves by climate change, and the negative externalities of global warming are impacting these companies only indirectly. Besides, the multiple case study shows that production, in the manufacturing sector, really is a fundamental function that needs to be protected by firms in order to avoid negative inconveniences due to climate change.

Figure 4.1.4 shows in synthesis what was demonstrated by the multiple case study.

Figure 4.1.4. What the multiple case study analysis show.



(Pivotto V., 2023)

4.2 Discussion

In this section, a discussion of the results obtained through the multiple case study, compared with what the literature states, is provided.

As previously mentioned, the analysed companies undertook sustainable innovations that mainly impacted their key activities, but they also affected other

functions, such as the relationship with customers or the legal aspect. Therefore, the sustainable innovations altered the business models of Manifattura Bini, Fimotex, and Stamperia Olonia, involving sustainability in several functions. This, indeed, is in line with the thoughts of Bocken, N. M., and Geradts, T. H. (2020), David A. Lubin and Daniel C. Esty (2011), and Ioannou, I., and Serafeim, G. (2019) who state that every function of a company should take sustainability into consideration.

Besides, for all three studied enterprises, the sustainable transitions started due to external inputs: Bini embraced the philosophy of Blåkläder and committed more to protecting the environment once it got to know the brand; Fimotex was spurred by the neighbourhood to eliminate the smoke cloud; and Stamperia Olonia, thanks to the proposition of Arcroma, was able to try new substances that enhanced their printing process, as it was the case of the newly introduced resins. The green transitions also occurred after tests and examinations conducted by the companies: Bini, Fimotex, and Stamperia Olonia, before implementing the innovative sustainable solutions under study, made sure that the latter were suitable for the companies and that improved their functions. Finally, the sustainable transitions resulted in innovations of the business models touching more than one department (as previously explained). Bocken, N. M., and Geradts, T. H. (2020) support what the three enterprises informally did, by suggesting that business models should be innovated for sustainability through dynamic capabilities (sensing, seizing, and transforming. See Chapter 1, section 1.4). Differently, Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) say that the first step that leads to the sustainable transition is to satisfy legal standards, as Stamperia Olonia and Fimotex did. Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) believe that another step is to include sustainability when designing products and services, precisely what Manifattura Bini did with the fabric realised from recycled materials. A further step suggested by Ram Nidumolu, C.K.

Prahalad, and M.R. Rangaswami (2011) is to innovate the business model, that is to say, to modify the way firms operate and do business by finding new solutions; something that was accomplished in all three firms. It is also possible to say that the analysed companies accomplished the second stage suggested by David A. Lubin and Daniel C. Esty (2011), to improve products and processes in order to get more efficient, but also the third stage, to innovate sustainably the core business in order to grow.

In addition, sustainability in the studied companies is shown to be mainly driven by the CEOs or by company culture. Indeed, Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) explain that the influence of top management is capable of driving sustainable transitions.

The reasons behind the sustainable innovations taken on by the analysed companies range from improving reputation (as for instance Fimotex), to lowering costs and consumption (as for instance Stamperia Olonia), to being more sustainable (as for instance Manifattura Bini). In contrast, COP26 (UK COP26, 2021), Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) and Bocken, N. M., and Geradts, T. H. (2020) believe that the main reason for innovating BMs for sustainability is to fight climate change, enable the transition to an economy with zero emissions and positive contribution to the environment; hence, theory says it is not sufficient that only some sectors change, but rather the whole economy. However, Henderson, R. M., Reinert, S. A., Dekhtyar, P., and Migdal, A. (2015) note that firms are trying to innovate themselves in order to comply with regulations, since the latter impose limits and restrictions; this is indeed one reason why Stamperia Olonia and Fimotex undertook sustainable business model innovations: Stamperia Olonia needed to have low levels of pollutants in waste water, and Fimotex had to treat smoke before releasing it in the atmosphere. Finally, one aspect that is not applicable to the case studies of this thesis, but that is instead well-considered by theory is imitation; Ioannou, I., and Serafeim, G. (2019) and

Bocken, N. M., and Geradts, T. H. (2020) consider imitation as a potential reason for companies to carry on sustainable business model innovations, even if often it is not a source of benefits for firms.

Besides, the objectives selected firms are aiming to is to reuse water (Fimotex and Stamperia Olonia) or invest in renewable energy sources (Manifattura Bini): these future goals are supported by theory since they promote sustainable transitions, which are needed to reach the 17 SDGs and the Paris Agreement targets.

Additionally, even though climate change is indirectly impacting the production processes of Stamperia Olonia and Fimotex, it is not the main driver of sustainable business model innovation (as previously mentioned). As for theory, instead, Ai, L., and Gao, L. S. (2023) describe that climate change is already heavily affecting firms and their operations, and it can be considered an external factor that encourages BM innovation.

Finally, it is hard to quantify the benefits selected enterprises obtained with the sustainable business model innovations; however, as the interviewees noted, workers are satisfied and happy about the results: Manifattura Bini was able to deliver faster and maintain high-quality products, Fimotex stopped the blaming regarding the smoke cloud, and Stamperia Olonia become more efficient in their production process. Indeed, Henderson, R. M., Reinert, S. A., Dekhtyar, P., and Migdal, A. (2015), Ram Nidumolu, C.K. Prahalad, and M.R. Rangeswami (2011), and Bocken, N. M., and Geradts, T. H. (2020) believe that if firms are able to use environmental commitment as the input to innovate for sustainability, then companies gain competitive advantages and improve reputation (in addition to all other benefits mentioned in this thesis), as it is the case of the studied firms.

As it can be seen from the multiple case study analysis and the discussion, the **results mainly support** what is said or suggested by researchers, agreeing with concepts and proving that, in the corporate world, those theories are really applied. For instance, the five stages suggested by Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011) (see Chapter 1, section 1.4) seem to be confirmed by the case studies.

However, **differences** between literature and multiple case study exist because, for the studied firms, sustainability is a means that enables them to reach goals, not the only or primary goal. As previously explained, **sustainability** in the three cases has changed its significance with respect to theory: sustainability in the multiple case study analysis has become a practical aspect (instead of a theoretical concept as literature considers), it is about long-lasting materials, best quality products, compatible substances, or using fewer materials. Green has become a consequence of long-lasting. Another point, as mentioned, is imitation; this factor is not, for the three companies, a motivation to undertaking sustainable BM innovations. Additionally, one great discrepancy from theory is the fact that Stamperia Olonia, Fimotex, and Manifattura Bini mentioned being neither particularly nor directly influenced by climate change, with the exception of unpredictable, extreme, rare events (for example hail storms). This difference is probably given by the fact that Lombardy (where the selected firms are located) is not a region particularly subject to many climate change effects that threaten companies, even if global warming is already visible in hotter and drier summers or unusual changeable weather.

Finally, to be noted is that considerations about **business model canvas** do not appear in the data analysis section. This is because this representation of BMs, as the critique of Osterwalder and Pigneur believes, is generic and simple, plus it has a straightforward, plain definition of sustainability. Business model canvas has shown to

not be sustainability-oriented and, in practical cases, it is not suitable for implementing green strategies. For what concerns the case studies, the business model canvas might not be appropriate to show the innovations of the firms and the impact these innovations had on the business model. Indeed, what could seem a minor and insignificant change in the business model canvas, can instead be a greater modification for the enterprise with a relevant impact. Therefore, the business model canvas is here criticised for not being in support of the results of this thesis.

The case studies present in this thesis show how harder it is, with respect to theory, to include sustainability in every aspect of the business model and to make companies greener. Telling companies to invest in sustainability is way different than actually implementing this vision. The execution phase is costly, time-consuming, and it requires the right mindset both in change-makers and change-recipients. Despite this, for the analysed enterprises, sustainability enables firms to reach their goals and, at the same time, give a positive contribution to the environment and fight climate change.

From the multiple case study analysis, it is also visible that many companies like Manifattura Bini and Fimotex, for various reasons, do not monitor consumption and sustainable improvements, something that is suggested as good practice in the results and considered by theory as fundamental: indeed, as David A. Lubin and Daniel C. Esty (2011) say, “if they can’t measure sustainability data, they can’t manage it” (p. 76). In addition, as suggested in the results, theory believes it would also be better to build strategic plans of action on how to sustainably transform businesses instead of investing without plans when resources are available, as it is the case of Manifattura Bini and Fimotex.

Finally, the future objectives of the three firms (invest in renewable energies, and reuse waste water in the production processes) are in line with what is suggested by the

literature, even if for the studied companies there are not yet plans on how to actualise these goals.

This thesis **contributes** to literature gaps by providing concrete examples of firms in the manufacturing sector in the Lombardy region, in Italy. Sustainable business model innovation is still an underdeveloped topic, hence not all aspects are already studied, verified, or solved by theory. An example is that the reasons why companies carry on sustainable BM transitions are not yet clear. In this thesis, some practical motivations are given, even if they are circumscribed to the manufacturing sector in Lombardy. Another gap in the literature is how to implement the sustainable transition: theory does provide suggestions of stages (for instance the ones recommended by Ram Nidumolu, C.K. Prahalad, and M.R. Rangaswami (2011). See Chapter 1, section 1.4) that usually firms go through, even if they are not yet consolidated and cannot be applied to all cases. Therefore, this thesis provides, as examples, the methods that the three enterprises used to innovate their own business models.

In addition, with the multiple case study is understood that climate change is not the main driver for sustainability changes in companies belonging to the manufacturing sector in Lombardy. Sustainability is however, in the short term, a **means** that enable firms to accomplish their goals, and in the long term, a **vision** that inspires companies. This thesis also shows *where* and *from what* the studied companies started when they wanted to innovate their business models, the steps followed to implement the green innovations, and which part of BM they tended to innovate first and the most.

The **main idea** that lies behind this thesis is that in order to fight climate change, engage in protecting the environment, give a positive contribution to the latter and to society, and achieve the 17 SDGs, sustainable innovation of the entire business model

of firms is needed. It is not enough to carry on sustainable actions or activities, in order to be on pace with the fight of climate change and its negative effects. Therefore, this thesis shows evidence of the necessity of sustainably innovating BMs and it exemplifies how to do this in one specific sector.

For practitioners and managers, firstly, this thesis urges enterprises to act taking the **environment into consideration** when making any decision: indeed sustainability should permeate each function and activity of companies. Secondly, for those managers that **fear sustainability transitions**, this thesis shows that the right focus is not on the present moment, where sustainability is a costly investment, but on the future knowing that benefits will be gained and a positive contribution to society and the environment will be given. Thirdly, managers and practitioners can find in this thesis **examples** of three similar but unique cases on how to undertake sustainable innovations to business models, such that these case studies can be taken as a reference point or as a starting point for firms to completely innovate their enterprises. Fourthly, this thesis wants to contribute to giving managers and practitioners the **right mindset** to accomplish the 17 SDGs; in fact, in order to make every function and every area of companies sustainable, change needs to be brought and retained effectively. Therefore, managers and practitioners should bring sustainability and love for the environment in their hearts to be able to transmit this passion to workers. Managers and practitioners should be responsible for making sustainability be felt as an urgency or a necessary adaptation **from the inside** of people, rather than an obligation or an imposition from the external environment. Fifthly, as suggested by theory, managers and CEOs should think about establishing **CSOs** (Chief Sustainability Officers) and allocating them the right resources; plus, the position of CSO should not be restrained to its own function, but, instead, it should collaborate with all other departments,

support and drive the company in sustainable innovations and transitions, by building sustainable strategies and including *green* actions in everyday tasks.

For what it regards governments and regulators, this thesis wants to highlight how important it is that the corporate world become greener. This implies that governments should first **stimulate firms** to undertake sustainable transitions; indeed, enterprises, if they feel spurred by national and international bodies, might be more inclined to act towards sustainability. This can be done in many ways, ranging from incentives, to prizes, to support, or better, with smart ways that help companies in the sustainable transition and at the same time also enable the government to benefit. Secondly, governments and regulators should be responsible for bringing people a **sustainable way of thinking**, this is because for sure a commitment towards the environment should be certainly demonstrated by companies, however, the small contribution of everyone, as the interviewees of the case studies believe, is capable of making the difference in this world. Hence, governments and regulators would give their support to managers and practitioners in **spreading awareness** about climate change and its urgency. Thirdly, governments and regulators should promote **exchanges** between companies and between countries, such that collaboration is fostered, people learn from what others do well, and new ways of positively contributing to climate change are found together.

4.3 Conclusion

This thesis, through a multiple case study analysis of three textile manufacturing enterprises in Lombardy, provides examples of companies that innovated their business models for sustainability. Starting with the concept of business model

innovation, and passing through climate change, the literature review chapter develops and ends with the concept of sustainable business model innovation.

Business model innovation aims at giving competitive advantages to firms, therefore it is an essential tool for companies to survive in dynamic environments. The innovation of the business model can be achieved by varying one element of the BM, several elements, or their interactions. Moreover, business model innovation might be pushed by climate change pressures. **Climate change**, indeed, is a risk that is threatening the whole planet; in order to reduce its negative effects, the global temperature should be limited to an increase of 1.5°C. Organisations, institutions, and people in general are not acting fast enough to fight climate change, therefore firms are being severely impacted by it. As a consequence, collaboration among countries is to be preferred and urgency needs to be spread. Plus, the manufacturing sector is left with much responsibility as its contribution is relevant to slowing down climate change.

Due to the insufficiency of current efforts, and in order to accelerate the run against global warming, this thesis proposes to include sustainability in the business models of organisations. Doing this enables firms to get more competitive by fighting climate change. **Business model innovation for sustainability** is therefore the solution (for the corporate world) suggested in this thesis to really reach the Paris Agreement targets and the 17 SDGs: not only taking on green actions but innovating the business models. Sustainability should not, in fact, be limited only to one function but rather taken into consideration in every corporate aspect. The green transition can be achieved in different ways following little steps that guide enterprises to innovate business models and to ideate a performance system calibrated on sustainability.

The analysis of the three textile manufacturing companies, in the form of **multiple case study analysis**, follows. Each selected enterprise is analysed singularly, and then the three cases are compared and evaluated in a **cross-analysis**. Regarding the

methodology used for the data analysis, the research takes the form of a **qualitative** one, studying the daily life of organisations (in this thesis case) without separating the case from the environment in which it is immersed. Qualitative research gathers data on-sight and it uses interviews: indeed, sources of the case studies mainly come from tailored semi-structured interviews, then also online sources and direct observations. The approach used in the data analysis is inductive: from observations, theory is expanded. The results of the cross-analysis (reported below) show *how*, *why*, and to which extent the three companies have innovated their business models for sustainability, what aspects of the BM the sustainable transitions altered, what future objectives the companies plan to carry on, and the influence of climate change on the business models.

To **answer the research question**, the sustainable innovations taken on by Fimotex, Manifattura Bini, and Stamperia Olonia had mainly altered, to different extents, the production processes and the key activities of the three companies. However, also other functions of the firms have been involved in the green transitions, as it is the case of the relationships with customers. As a consequence, it is possible to say that these changes have innovated the business models of the selected enterprises, altering the way these firms do business. The transformation process of the firms into more sustainable ones is different for each of them, but these transitions happened in all of them thanks to external inputs, such as partner companies or geographical contexts. What the companies aimed to, was to comply with regulations, improve their reputation, reduce consumption and costs, decrease the environmental footprint, and maintain the high quality of products. In the multiple case study, sustainability is both a means that help firms to perform their short-term goals and as well a long-term ultimate objective to be accomplished. In fact, for the future, Stamperia

Olonia and Fimotex want to reuse waste water, and Manifattura Bini wants to invest in renewable energies. Finally, although water scarcity is a threat to the three companies, climate change is not yet a driver of change for the firms under study.

The research question is hence **satisfactorily answered**: the data analysis covers all the sub-questions discussed in the research question, providing three different answers, one for each selected company; plus, a general consideration of the textile manufacturing industry in Lombardy, coming from the cross-analysed results, further answers the research question.

The **interview method** proved to be the most suitable for the analysis since it enabled the collection of direct data (on-sight and in first person), the possibility of getting deeper into the topics by asking further clarifying questions, and the direct contact with the workers of the firms from which a personal relationship with the interviewees was established.

However, the **drawbacks** of using the interview tool are the fact that data was subjectively collected and analysed, and it cannot be separated from its context. In addition, there might have been issues regarding the reliability or validity of data, incoherence in responses, and finally, interviews were time-consuming. Difficulties were also present in the data analysis process, transforming quotations into clear formal text, and in checking the translations.

Besides, globally this thesis does not lack **limitations**. The proposed analysis is to be considered valid for the analysed cases; for what it concerns, instead, other similar companies, the multiple case study analysis here provided should be intended as an exemplification and not as the only way possible to operate. Furthermore, this analysis can be applicable to the textile manufacturing sector in companies with akin

characteristics to the studied firms; similar firms belonging to other industries should use this thesis as a starting point or as comparable material.

Managers and practitioners are suggested, in this thesis, to include sustainability in corporate decisions, to consider the benefits deriving from it, to trigger a *green* mindset in companies, to establish CSOs, and to follow the cases of the three analysed firms as guidance for sustainable innovations.

Governments and policy makers are invited to create stimulus in firms to innovate their BMs for sustainability, to spread awareness in people, and to promote inter-companies and international exchanges to foster collaboration.

The **key takeaway** of this thesis is that sustainable innovation of entire business models is an effective solution to reach the sustainability objectives of keeping global temperature below 1.5°C and reaching the 17 Sustainable Development Goals. An innovation that transforms more than one aspect of the way firms do business is what is needed to fight climate change, halt the negative consequences of global warming, and start on the way of giving positive contributions to our planet (and not just reducing the negative impacts). Furthermore, it can be concluded that **sustainability** in the multiple case study analysis is both a tool to reach companies' goals in the short term, and the vision for the long term future.

Of the sub-questions that constitute the research question, it is possible to consider still **unresolved** by a certain degree the process taken to innovate business models. In fact, this thesis provides answers for this sub-question, but the responses cannot be considered as a proper model for other firms outside the selected ones. It is possible to use the case studies presented here as general guidelines on how to proceed,

however, each enterprise is unique, and thus the same exact procedure shown in this thesis might be difficult to apply to other cases.

The research conducted in this thesis leads to **further questions**: for example, why do firms wait for climate change to negatively affect them and produce disasters before acting in support of the environment? How can it be possible to effectively spur companies to start the path towards sustainable transitions? How to make people aware of climate change and install in them a feeling of protection towards the environment? How is it possible to create a mindset of action willing to anticipate the negative effects of climate change? Why companies, despite being aware of the benefits of sustainable innovations, are still hesitant and sceptical in front of sustainable changes?

It is believed that the **next urgent step** in research would be the one of finding effective ways on how to prompt people and firms to act green, let them feel the environment and society as important for them, fear climate change, and be willing to act starting from now. Acting with a genuine interest rather than with economic enthusiasm or concern for power.

Finally, the author of this thesis believes that in many countries and in many companies (even in Lombardy), there are still a lot of people who do not care about the environment. Sustainability often is considered as optional, as secondary, as something that is to be done but not urgently. By contrast, there are certain public relevant figures who continuously share with the world the importance of the subject. It seems that the world is divided into environmental supporters and environmental indifferents. To be able to act at a decent pace to slow down global warming, the current course of action is not even enough. The more time passes, the less is possible to do to fight climate

change, the more negative externalities hit the world, and the faster we need to act. Therefore, fostering a sustainable business model in every company is already a great step, but not sufficient. **Everyone should contribute** to the environment, as the latter is our home; even a small contribution can make the difference. However, to make this possible, reaching and touching the hearts of people is necessary; only when something is really felt personal, start people acting. Proceeding too slowly might not be effective; however, the technique of focussing on taking one step at a time can help, instead of just looking at the bigger goal to achieve.

The author of this thesis **wishes** that her work can contribute to spreading sustainability awareness in the corporate world, be used by managers and firms to take inspiration and transmit them the willingness to do more for the environment, and pushes them to transform for sustainability their companies. The author imagines a world where everyone cares about others and our future generations, such that preserving the Earth is absolutely necessary in order to leave a beautiful world to our descendants. Changing the world is now left in the hands of younger generations, like the one of this author, and, since the world is being brusquely shaken by climate change, these young people want to assure themselves and their heirs to live on a green and enjoyable planet.

VIII. REFERENCES

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IX. ANNEX

6.1 Interview guide examples

SUSTAINABILITY DIRECTOR

Draft of an **interview guide** tailored for the sustainability director (English version).

· *Introduction to interviewer*

Good morning, I am Veronica Pivotto, Double Degree student in the Economic field in the French university IESEG of Paris and Lille, and in the Italian university LIUC Cattaneo University in Milan.

· *Description of project*

As I briefly told you before, my thesis project is to write about companies that aim to transition towards more sustainable business models, and your company agreed to participate in this project. I believe yours is an interesting case to study and therefore I would like to interview you today.

· *Confidentiality*

To write my thesis, I would need to record this interview, which would help me in analysing data. I won't disclose the information included in this interview outside of my thesis. Do you have any questions? Is it okay if we start recording now?

1)Introduction to the interviewee

1. Can you please introduce yourself in a few words?

i. Can you explain to me your role in the company?

ii. What satisfies you the most in your job?

2. What does your company do?

3. What is your company already doing for the environment?

i. When did this sustainable transition start?

4. What pushed your company to innovate itself?

2) Transition to a sustainable business model

1. What part of the business model does your company want / did your company want to innovate to become more sustainable?

2. How are you planning / did you plan to do it?

i. Which practices do you plan / did you plan to take on?

ii. Why?

3) Reasons for the transition to a more sustainable business model

1. Why does your company want / did your company want to change or innovate the business model to become more sustainable?

2. What do you want / did you want to achieve with these innovations?

4) Changes in the business model of your company due to external factors

1. Which aspects or variables of climate change impact your company?

i. What function of your company is climate change affecting the most?

2. What aspects of the business model will probably remain / did remain unvaried after the sustainable innovation?

i. Why?

5) Measurement of progress

1. How do you plan to monitor the sustainable improvements you will be undertaking / you undertook?

2. How often do you redefine goals and objectives to continuously become greener (and give a positive contribution to the environment and society)?

· Do you have anything else you would like to share?

· Do you have any other questions from your side?

- *Thank you very much for the time you dedicated to me and for your availability.*

Draft of an **interview guide** tailored for the sustainability director (Italian version).

- *Introduzione all'intervistato*

Buongiorno, sono Veronica Pivotto, studentessa in economia, in doppio diploma nell'Università Cattaneo LIUC di Milano e nell'università francese IESEG di Parigi e Lille.

- *Descrizione del progetto*

Come brevemente preannunciato, il mio Progetto di tesi è di descrivere aziende che mirano a svolgere una transizione verso modelli di business più sostenibili, e a questo proposito la sua azienda ha accettato di partecipare in questo Progetto. Ritengo che il vostro sia un caso interessante da studiare e vorrei quindi intervistarla oggi.

- *Privacy*

Ai fini della mia tesi, avrei bisogno di registrare questa intervista, la quale mi aiuterebbe nell'analisi dei dati. Non divulgherò le informazioni raccolte al di fuori della mia tesi e i vostri dettagli personali rimarranno segreti. Ha qualche domanda? Posso iniziare a registrare adesso?

1)Introduzione

1. *Si può presentare in qualche parola?*

i. Potrebbe spiegarmi il suo ruolo in azienda?

ii. Che cosa la soddisfa di più nel suo lavoro?

2. *Di cosa si occupa la sua azienda?*

3. *Che cosa fa già la sua azienda di sostenibile?*

i. quando è iniziata questa transizione ecologica?

4. Cosa vi ha spinto a cambiare / innovare?

2) Transizione verso modelli di business sostenibili

1. Quale aspetto del modello di business la sua azienda intende innovare / ha innovato (per diventare ancora più sostenibile)?

2. Come prevedete di farlo / come avete fatto?

i. Quali pratiche avete intenzione di intraprendere / avete intrapreso?

ii. Perché?

3) Ragioni per la transizione verso modelli di business sostenibili

1. Perché la sua azienda vuole / voleva cambiare o innovare il modello di business (per essere più sostenibile)?

2. Cosa volete / volevate raggiungere con queste innovazioni?

4) Cambiamenti nel modello di business della sua azienda derivanti da fattori esterni

1. Quali aspetti o variabili del cambiamento climatico hanno un impatto sulla sua azienda?

i. Quali funzioni della sua azienda sono le più influenzate dal cambiamento climatico?

2. Quali aspetti del modello di business probabilmente rimarranno / sono rimasti invariati dopo l'innovazione?

i. Perché?

5) Misurazione dei progressi

1. Come intendete monitorare i miglioramenti ecologici a cui la sua azienda andrà / è andata incontro?

2. Ogni quanto ridefinite gli obiettivi per continuare a diventare sempre più sostenibili (e dare un contributo positivo all'ambiente e alla società)?

- *Ha altro che vorrebbe raccontarmi o condividere con me?*
- *Ha qualche domanda?*
- *La ringrazio molto per il suo tempo dedicatomi e per la sua disponibilità.*

CEO / OWNER

Draft of an **interview guide** tailored for the CEO (English version).

- *Introduction to interviewer*

Good morning, I am Veronica Pivotto, Double Degree student in the Economic field in the French university IESEG of Paris and Lille, and in the Italian university LIUC Cattaneo University in Milan.

- *Description of project*

As I briefly told you before, my thesis project is to write about companies that aim to transition towards more sustainable business models, and your company agreed to participate in this project. I believe yours is an interesting case to study and therefore I would like to interview you today.

- *Confidentiality*

To write my thesis, I would need to record this interview, which would help me in analysing data. I won't disclose the information included in this interview outside of my thesis. Do you have any questions? Is it okay if we start recording now?

1)Introduction to the interviewee

1. Can you please introduce yourself in a few words?

i. Can you explain to me your role in the company?

ii. What satisfies you the most in your job?

2. What does your company do?

3. What are the values of your company?

4. What is your company already doing for the environment?

i. When did this sustainable transition start?

5. What pushed your company to innovate itself?

2) Transition to a sustainable business model

1. What part of the business model does your company want / did your company want to innovate to become more sustainable?

2. How are you planning / did you plan to do it?

i. Which practices do you plan / did you plan to take on?

ii. Why?

3) Reasons for the transition to a more sustainable business model

1. Why does your company want / did your company want to change or innovate the business model to become more sustainable?

2. What do you want / did you want to achieve with these innovations?

4) Changes in the business model of your company due to external factors

1. Which aspects or variables of climate change impact your company?

i. What function of your company is climate change affecting the most?

2. What aspects of the business model will probably remain / did remain unvaried after the sustainable innovation?

i. Why?

5) Measurement of progress

1. How do you plan to monitor the sustainable improvements you will be undertaking / you undertook?

2.How often do you redefine goals and objectives to continuously become greener (and give a positive contribution to the environment and society)?

- *Do you have anything else you would like to share?*
- *Do you have any other questions from your side?*
- *Thank you very much for the time you dedicated to me and for your availability.*

Draft of an **interview guide** tailored for the CEO (Italian version).

- *Introduzione all'intervistato*

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- *Privacy*

Ai fini della mia tesi, avrei bisogno di registrare questa intervista, la quale mi aiuterebbe nell'analisi dei dati. Non divulgherò le informazioni raccolte al di fuori della mia tesi e i vostri dettagli personali rimarranno segreti. Ha qualche domanda? Posso iniziare a registrare adesso?

1)Introduzione

1. Si può presentare in qualche parola?

i. Potrebbe spiegarmi il suo ruolo in azienda?

ii. Che cosa la soddisfa di più nel suo lavoro?

2. Di cosa si occupa la sua azienda?

3. Quali sono i valori della sua azienda?

4. Che cosa fa già la sua azienda di sostenibile?

i. quando è iniziata questa transizione ecologica?

5. Cosa vi ha spinto a cambiare / innovare?

2) Transizione verso modelli di business sostenibili

1. Quale aspetto del modello di business la sua azienda intende innovare / ha innovato (per diventare ancora più sostenibile)?

2. Come prevedete di farlo / come avete fatto?

i. Quali pratiche avete intenzione di intraprendere / avete intrapreso?

ii. Perché?

3) Ragioni per la transizione verso modelli di business sostenibili

1. Perché la sua azienda vuole / voleva cambiare o innovare il modello di business (per essere più sostenibile)?

2. Cosa volete / volevate raggiungere con queste innovazioni?

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i. Quali funzioni della sua azienda sono le più influenzate dal cambiamento climatico?

2. Quali aspetti del modello di business probabilmente rimarranno / sono rimasti invariati dopo l'innovazione?

i.Perchè?

5) Misurazione dei progressi

1.Come intendete monitorare i miglioramenti ecologici a cui la sua azienda andrà / è andata incontro?

2.Ogni quanto ridefinite gli obiettivi per continuare a diventare sempre più sostenibili (e dare un contributo positivo all'ambiente e alla società)?

- Ha altro che vorrebbe raccontarmi o condividere con me?*
- Ha qualche domanda?*
- La ringrazio molto per il suo tempo dedicatomi e per la sua disponibilità.*