A Work Project, presented as part of the requirements for the Award of a Master's degree in Impact Entrepreneurship and Innovation from the Nova School of Business and Economics.

Pedagogical Case Study: Sustainable Business Model Innovation in the Construction Industry
Re-thinking Natural Building Techniques

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This Work Project takes the format of a Teaching Case Study. This case study encourages reflection and discussion on Sustainable Business Model Innovation (SBMI) transitions and tensions. These topics are explored by looking at the case of a mainstream Real Estate company that finds the need to address a pressing real-world issue: its environmental impact. The case encourages students to discuss the feasibility and impacts of incorporating a traditional, eco-friendly, Portuguese building technique into the main activities of the company.

The Case Study

Introduction

Rachel had never been so stressed coming into the office. It was her third year working as the Chief Innovation Officer of "Lusitano Developers". She was getting herself ready for one of the most important meetings of her career. Rachel was about to take centre stage in a board meeting called to decide on the findings of a 6 month-long study led by her on sustainable construction methods. That meeting could eventually change the whole trajectory of the company, and Rachel was feeling the responsibility.

Just 8 months before that day, in late 2021, Rachel attended an eye-opening EU Taxonomy and Sustainability conference in Berlin. She was aware of the pressure for sustainability was growing all around for the real estate business. From the legal side, the EU Taxonomy and other sustainability frameworks were being designed in a way that in just a few years businesses with a high environmental impact would be left behind by both investors and consumers. Being sustainable was the only option, but how sustainable?

Lusitano Developers had already been in business for 10 years. The residential developing sector in Portugal was relatively safe and profitable and Lusitano Developers had a good business strategy, at least for an era where CO2 emissions were not a concern. But coming to 2022, Lusitano Developers had good motives to look forward with apprehension: they were building based on cement, one of the most polluting materials in the world, in a sector responsible for a high share of global emissions. Changing to a less polluting cement supplier, including solar panels in the houses they were building and adding all the most up-to-date features could keep them up with the law and competition. However, if Rachel's intuition was right, looking forward, these small initiatives were not the bold future-proof step that Lusitano Developers needed to keep ahead in this fast-changing sustainability landscape. Rachel knew that both regulation and consumers are more and more demanding every day. Now, after 6

months of research, Rachel and her innovation team proposed to the board of directors a plan of action to change the company's business model. That plan consisted of drastically reducing the amount of cement, insulation and HVAC equipment by adopting a traditional construction technique called Compressed Earth Blocks[1] (CEBs). This technique reduces toxicity, has a high thermal mass, is biodegradable at the end of life, and is extremely well adapted to the Portuguese humid and temperate climate. However, this technique had never before been tested on a large scale, so the risk associated with this was undeniable. Its implementation could either be reported as a disaster or as a visionary decision. The board had to make a decision: continue with the business as usual while trying to make small steps towards more sustainable choices, or fully embrace the sustainability trend and reformulate their business model.

Company Background and Industry

The Portuguese residential development industry is a dynamic and evolving sector characterized by several key attributes. As of 2021, the industry maintains a substantial market size, with a growing demand for housing across the nation, driven by factors such as urbanization, tourism, and foreign investment. APPII, the national entity that represents real estate developers stated that in that year, the volume of investments in the sector represented 15% of the national GDP[2]. The number of dwelling transactions is growing steadily - in the past 5 years, it has raised by 54% (INE)[3].

Before founding the company "Lusitano Developers", Michael and Tania worked together for 12 years in the Portuguese office of a Multinational Developer Company. Michael's charisma and persuasive personality made him an excellent salesman, which allows him to connect with people easily. Michael is a visionary and a risk-taker. He has always been the dreamer of the two, with a creative and ambitious mind. He's optimistic and not easily discouraged by challenges. Tania worked as a project manager. Tania is the pragmatic and organized half of the partnership. She is methodical, detail-oriented, and risk-averse compared to Michael. Tania is the one who keeps track of budgets and timelines. She is also a problem solver and thrives in structured environments.

Michael and Tania have been good friends since they took a course together in university. After more than a decade working together in the same office, they knew each other very well. In 2010, Michael felt the urge to quit his job and followed his desire for entrepreneurship. He felt his expertise, network and long-term vision were strong enough to successfully found a new Real Estate Developer business in Portugal. He knew the market and knew where the

Multinational Company he worked for was failing to capture value. Michael saw how the buildings being built in Portugal seemed like a simple copy of what the multinational was doing in other countries. The residences and buildings were produced in a factory style, with little character and cultural significance. Michael asked Tania if she was interested in joining him. He knew their skills complemented each other, and Tania's rationality and structured thinking made her the perfect co-founder. Tania

was ready for an adventure and accepted the challenge. Together they created Lusitano Developers, with the mission of "enriching lives through unique innovative houses with the Portuguese signature". Their differentiation was being customer-centric, and their houses extra personalizable while maintaining a unique Portuguese signature and aesthetics. The business model was simple – purchase strategic pieces of land and build functional middle-class residences that were beautiful and fit into the landscape. In 2011, their first year, the company bought 3 pieces of land, where 8 residences were built. The year after that, 80% of the houses were sold and 12 more were built. Steady growth continued in the following years.

Lusitano Developers was able to find investors along the way and welcome new team members. Currently, Lusitano Developers has two main investors. One of them has a 20% stake in the company and is their cement supplier. The other one is an angel investor who currently owns 10% of the company and is known in the real estate industry for his expertise.

The company now employs 280 full-time workers and has solidified its reputation for delivering quality residences. Since its creation, it has built 364 residential units, both in single houses and multi-family residential sites. The company is now, in 2021, averaging an annual revenue of 45 million, being the 4^{th} largest in the country.

The company has been taking actions towards being more environmentally sustainable. Lusitano Developers started paying more attention to the energy efficiency of their buildings, choosing less-polluting materials and incorporating renewable energy where possible. These actions, however, did not hide the carbon footprint of their activities. Lusitano Developers' construction methods were the same as the industry's common practices. Buildings were built using cement, fired bricks, steel, and plastic insulation. The sustainability report published by the company in 2021 showed that Lusitano Developer's carbon footprint was 5632 tonnes of CO2, 0.3 metric tons/m2. Being part of one of the most environmentally impactful industries[4], Lusitano Developers always tried to keep up with the sustainability trend and incorporate aspects of it where it made sense, but while avoiding having to sacrifice financially.

Rachel's epiphany

Rachel's position in the company required her to keep up to date with the changing market, trends and regulations. She decided to attend the "EU Taxonomy and Sustainability Conference" in Berlin to grasp the changing regulations and what they meant for the construction sector and the company. During the conference, Rachel listened and talked to people from various areas, companies and backgrounds. From legal advisors to representatives of hybrid organizations, Rachel got to learn about what the future legislation would look like, what companies are doing to adapt to them and what trajectory the world, its consumers and its investors are taking.

Rachel photographed a presentation slide she found interesting (Figure 1) and took notes of the relevant takeaways from the conference:

1) Sustainability was no longer just a social trend; it had also become a legal imperative. Conversations with environmental lawyers revealed that pressure was mounting on the legal front, as the EU was advancing a comprehensive plan to transition its economy to a low-carbon model[5]. While many existing regulations focused on disclosure requirements, there were also upcoming mandatory sustainability actions for companies in the pipeline[6].

2) The main regulation now in place was the EU Green Taxonomy. She learned that the EU Taxonomy[7] is a comprehensive and groundbreaking framework introduced by the European Union to categorize economic activities based on their environmental sustainability. This framework sets clear criteria for what can be considered environmentally sustainable within various sectors, including the construction sector.

3) Not only is regulation demanding, but it is also getting more and more demanding. The technical screening criteria for all activities, including construction, are supposed to be reviewed every three years[8], and the cement industry is for now considered not a "Normal" activity, but a "Transitional Activity", which means it is considered a highly polluting economic activity whose replacement will be imperative once a technologically and economically feasible low-carbon alternative is found[9].

4) It became very clear that investors were increasingly looking for eco-friendly and socially responsible businesses to support, while consumers were showing a strong preference for homes that reduced their environmental impact and energy consumption.

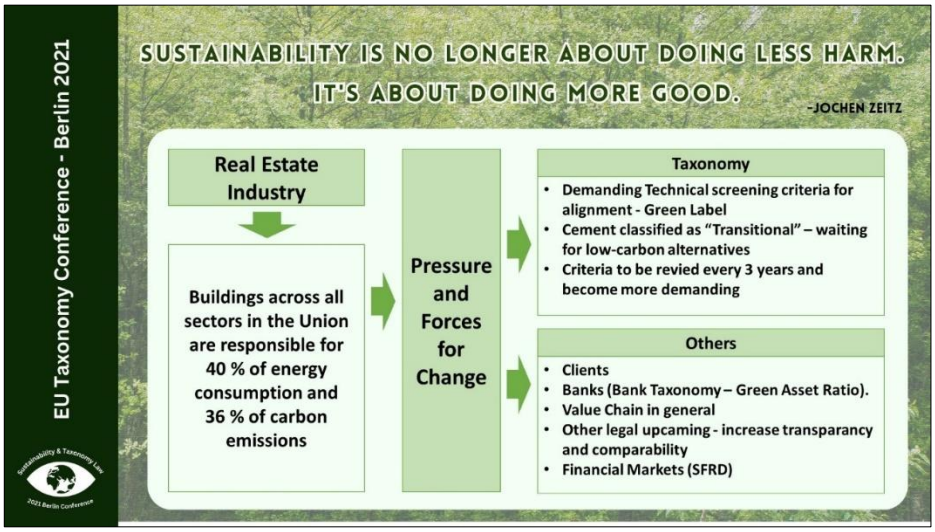

Figure 1 - The presentation slide shown at the Taxonomy Conference that opened Rachel's eyes. By: Author

Rachel realized that the construction industry was on the cusp of significant disruption due to its environmental impact and changing regulatory and market dynamics. She recognized that Lusitano Developers could no longer rely on incremental sustainability measures such as using slightly more eco-friendly materials or technologies. To thrive in the evolving landscape, the company needed a transformational shift. Other sector representatives present at the conference were doing just that. A clear example of this was the car industry, which was now investing heavily in electric vehicles.

Rachel got back to the office and started plotting down the various ways in which the company could reduce its carbon footprint by adopting different construction methods. She delved into wooden options but found that the market was already very crowded. Other real estate developers wanting to shift away from concrete were heavily investing in this method. While desperately researching other feasible construction options, she found a news article[10] that talked about a lost building technique traditionally used in Portugal and other places across the world, before cement was invented (Costa et al, 2018).

Rachel started researching more about this traditional building technique that relied exclusively on the compression of a natural material - soil. Due to the sustainability trend, this technique was seeing a resurgence in countries like Germany and Switzerland. Rachel saw the potential

and thought that this might be the answer she was looking for. Adopting the Compressed Earth Blocks (CEBs) building technique could be the leap the company needed to place itself one step above other businesses when it came to the future of the real estate sector. For Rachel, this could represent the innovative solution needed to stay ahead in the sustainability race. Rachel met with Michael and Tania and presented her idea of adopting this traditional construction technique, explaining to them why she felt there was a need to change the trajectory of the company.

The co-founders were perplexed but amused. Michael felt Rachel's excitement and found her proposal very interesting and refreshing. Tania's risk aversion made her feel hesitant towards Rachel's proposal. Nevertheless, Michael and Tania decided to give Rachel and the whole innovation team 6-months and a budget of 50.000€ to research the viability of adopting the CEBs technique.

The Natural Building Technique

Figure 2 - Compressed Earth Blocks - *https://arquitecturaviva.com/articles/btc-system*

For thousands of years, humans around the world have been building with some version of earthen bricks, made using compacted soil, often mixed with sand and organic materials (Hoque, 1991). CEB structures, like the Great Mosque of Djenné, built in the 13th century in Mali and part of the UNESCO World Heritage, are still standing to this day which shows the durability and resistance of this material.

Before modern machinery allowed it, blocks were manually compressed. Over the years, various creations and improvements of press machines have been developed. Nowadays, hydraulic press machines[11] can compress blocks up to 1800 PSI, making them much stronger than traditional hand-pressed earth blocks[12].

Compressed Earth Blocks have several advantages. Firstly, their high thermal mass proves to allow exceptional insulation properties, which decreases the need for air conditioning and heating indoors (Pacheco-Torgal & Jalali, 2012). It is breathable, resulting in a natural humidity regulator which also creates healthier indoor air quality when compared to cement houses (Costa et al, 2017). In addition to this, it is fire-resistant, tornado-resistant, mold-resistant and termite-resistant (Ben-Alon et al, 2020).

Another benefit of this technique is the fact that the machine that is used to compress the soil into blocks is portable and can be brought to the building site. This allows for the blocks to be made using the soil extracted for the foundations, or present around the rest of the property. If there is not enough soil on the property, builders can also choose to partner with quarries, which produce clay soil as a byproduct. CEBs can be made using almost every type of soil, as long as there is some clay content in it. The Portuguese soil is especially clay-rich, which is perfect for this type of construction method (Fernandes, 2013). The blocks are bonded together with a simple soil mortar that once dried binds the blocks together. In climates like Portugal where rain is common, the exterior walls need to be made waterproof. This is usually done with a mix of natural materials like lime and linseed oil (Eires et al, 2017). These materials allow it to be watertight while maintaining the wall's breathable properties.

Figure 3 - Earthen House in Portugal - https://www.arquisol.pt/

Research and Results

Rachel was determined to prove to the board that her idea was feasible, and the whole innovation team was eager to present a business model innovation plan. Together the team started brainstorming the most efficient ways of gathering the data they needed to prove the feasibility of implementing CEBs in Lusitano Developers.

Rachel and the team had a 50.000€ budget to answer the question:
Is it feasible to incorporate the Compressed Earth Blocks technique in Lusitano Developer's main activities?

Although Rachel's initial investigation into the potential of CEBs had taught her interesting facts, she felt the need to interview experts in the area to check her findings and clear the doubts she still had.
The innovation team spent the following 6 months interviewing[13] and surveying experts in CEB technology, who included architects, civil engineers, regulatory experts, and builders. CEBs homeowners and potential homeowners were also surveyed to understand the real challenges and motivations behind building a CEBs house. Academic research and studies were also

analysed. In addition to this, consultants were engaged for the assessment of the financial feasibility of this potential business model.

To better approach the main question, the team divided it into several sub-questions:
#1 How does the environmental impact of CEBs compare to the impact of conventional brick and cement technique?
#2 What are the social impacts of adopting this technique?
#3 How durable and resistant are CEBs?
#4 What is the process of making and building with CEBs?
#5 Why aren't CEBs more common? What is hindering their adoption?
#6 Is it financially feasible?

The following table depicts a summary of what the team concluded after conducting the interviews, surveys, field trips, and research analysis:

	Environmental Impact	Social Impact	Technical Feasibility	Financial Feasibility
Advantages	CEBs emit around 10 times less CO2 into the atmosphere compared to a conventional brick and cement wall.	CEBs have a positive impact on health and comfort, are culturally significant and can potentially contribute to the development of new skills in local communities.	Structurally, CEBs are comparable with conventional concrete buildings. They are suited to the Portuguese climate and are simple to produce and assemble	Materials are less expensive, in some cases soil can be free.
Challenges		Social acceptance – customers might not be "prepared" for this. Might be introduced in the market too soon which poses a challenge to marketing strategies and sales	Not a recommended technique for buildings taller than 2 stories	Although the materials can be cheaper, the lack of regulations can make this technique more expensive.

Table 1 - Summary of Findings

#1 How does the environmental impact of CEBs compare to the impact of conventional brick and cement technique?

Experts confirmed that the environmental impact of CEBs is undeniably better than conventional techniques.

During the interviews, Rachel was constantly reminded about the negative impact of the construction sector. The production and processing of modern building materials are

responsible for about 15% of the world's contributions to climate change, approximately 20% of global energy consumption, and potentially as much as 40% of the global generation of solid waste, as reported by King (2017).

Previously conducted Life Cycle Assessment (LCA) studies indicate that Compressed Earth Blocks (CEBs) may have the potential to demand lower energy and produce fewer Greenhouse Gas (GHG) emissions throughout their life cycle compared to similar construction methods (Ben-Alon et al, 2020).

While it is estimated that the material needed to build one cubic meter of a fired brick wall is responsible for 300 to 600 kg of CO2 emissions, one cubic meter of CEBs wall is only responsible for around 56 kg of CO2 (Asman, 2020).

A house featuring three rooms and constructed with earth walls, covering an area of 92 square meters, contributes to a reduction of 7 tons of CO2 emissions compared to using ceramic bricks and an even more significant reduction of 14 tons of CO2 emissions when compared to aerated concrete blocks (Pacheco-Torgal & Jalali, 2012).

#2 What are the social impacts of adopting this technique?

Rachel was aware that social impact was something valuable for businesses to evaluate. The social impact could be measured and studied within the following topics: access to 1) safe and 2) healthy housing, 3) job opportunities and development of new skills, and 4) alignment with cultural and traditional values (Burroughs & Růžička, 2019). Rachel questioned engineers and builders if they had any insights on the social impact of CEB buildings when compared to conventional building methods.

Around 85% of the experts the team interviewed referred to the positive health benefits of living in a house built with CEB. A World Health Organization report stated that 30% of newly constructed buildings across the world had several chemical contaminants from products and building materials, which caused health issues in occupants (Ben-Alon et al, 2020). In addition to this, mainstream buildings are known for poor ventilation and humidity trapping, due to the lack of breathability of cement. This is known to lead to bacterial and mold growth indoors (EPA, 1991). As earthen materials are non-toxic, they do not pose a danger to human health. Furthermore, due to their porosity, studies have shown that CEBs can maintain humidity levels between 40–60%, which are optimal for human health (Pacheco-Torgal & Jalali, 2012). Due to their high thermal mass, they are also able to passively preserve the indoor temperature humidity within a comfortable and healthy range, especially in hot climates (Ben-Alon et al, 2020). Not only this, but studies have also shown that earthen walls exhibit superior

performance in attenuating high-frequency electromagnetic fields emitted by sources like antennas, mobile phones and radars when compared to alternative construction materials, as demonstrated by Röhlen and Ziegert's (2011) study.

In terms of education and training, builders agreed that implementing CEBs can contribute to the development of new skills in local communities. One specific builder

stressed that the lack of labour force and knowledge is a limiting factor to the implementation of CEBs. He shared that after participating in his first CEB project, he was constantly called to participate in other builds. Since contractors couldn't find enough experienced workers, they asked him to guide and teach other construction workers, even though he had only done one project before.

These techniques are not taught in universities to engineers and architects, nor are common enough to be known by contractors. The education and training opportunities must exist for local communities to take advantage of them. Currently, that is not a reality, so it is uncertain the extent it would benefit the community, but experts are optimistic its wider adoption can contribute to local job creation.

In addition to this, most interviewed architects referred that a key social impact factor that differentiates CEBs from other techniques is their cultural significance. Since it is an adaptation from a traditional building technique used in Portugal for centuries it brings up an important aspect of our heritage (Costa et al, 2017). It also allows for the growing interest and knowledge on how to renovate and do maintenance of earth-block buildings still standing.

The social perception of CEBs and potential resistance to adoption was considered under question #5.

#3 How durable and resistant are CEBs?

Rachel was confused about the fact that CEBs were biodegradable but were still resistant and durable. Civil engineers gave her insights as to the structural characteristics of CEBs, as well as how they compare to traditional materials like concrete or brick. Experts explained that although strength tests show that CEBs alone are weaker and less stiff than conventional materials, the resulting structure they make once layered together, is comparable to conventional buildings (Ben-Alon et al, 2020). This is because the clay in soil is structural and the way the blocks are put together creates a monolithic structure that is extremely solid. Nevertheless, restrictions were referred, as was the case with the height limit of the building.

#4 What is the process of making and building with CEBs?

Like any construction project, a foundation must be built. Historically, foundations were made using stone, but since that is a timely and costly process, the best alternative is to use concrete. To minimize cement use, construction waste and recycled concrete can be incorporated into the mix. In mainstream construction, the cement used in the foundations accounts for 25% of the total cement used to build a house. Thus, even though cement cannot be fully replaced by CEBs, this technique reflects a 75% reduction in cement use for the construction of an average house. Depending on the building's size, engineers may opt for an integrated wooden structure fixated to the foundation. Following this, Compressed Earth Blocks are added to the structure. The CEB-making process involves digging soil, sieving out impurities, and using a hydraulic press machine to compress the soil into hard blocks. After being cured for one or two days, CEBs are laid using conventional masonry techniques, with mortar made from the same soil.

#5 Why aren't CEBs more common? What is hindering their adoption?

Rachel was curious about why on paper this technique seemed so appealing, but in practice no one was using it. Experts told Rachel the mainstream construction community is hesitant to adopt CEB primarily due to the reluctance of many professionals in the field to adopt unconventional techniques (MacDougall, 2008). In other words, it was a cycle caused by the industry's aversion to change.

From her in-depth interviews with experts, Rachel found that 5 implementation gaps prevent CEBs from becoming a mainstream practice: 1) Perceptual Gap, 2) Technical Gap 3) Regulatory Gap; 4) Field Gap; 5) Innovative Gap.

Firstly, Rachel understood that although this technique is gaining popularity, it is still perceived by most as unreliable and "dirty". Most regard a building that is made with earth as something provisory and unsafe.

Secondly, experts insisted that engineering data is scattered. In other words, the information on CEBs is not centralized, officialized or synthesized. This is a challenge that hinders the advocacy for CEBs.

Thirdly, although CEBs can be affordable, their omission from building regulations makes them more expensive. Some experts claimed this was the worst gap of them all. The lack of construction standards or official guidance leads to every structure having to be assessed individually by Structural Engineers. This incurs a much higher cost than an equivalent masonry building. This can be avoided if a stabilizer (concrete or lime) is mixed into the blocks. The addition of concrete or lime to CEBs ensures the construction complies with legal requirements

more seamlessly, thereby streamlining the approval and permitting process. This, however, poses a significant environmental impact, comparable with mainstream construction.

Fourth, the field gap refers to the lack of contractors and educated professionals. This stands as a consequence of the lack of inclusion in the building codes and regulations, which also leads homeowners to choose conventional building methods.

Lastly, the innovation gap is described by experts as the lack of research, higher education and technology development that hinders the adoption of CEBs. According to the in-depth interviews, Rachel understood that CEBs are still seen as a traditional niche of self-built homes, and without innovation led by academic research, CEBs will not be able to be adopted on a large scale.

#6 Is it financially feasible?

Part of the innovation team led the financial assessment of CEBs with the help of consultants. The team concluded that in terms of market and competition, the feasibility of CEBs seemed promising. There is a growing demand for natural building materials in construction and customers say they are willing to pay more for sustainability. Although the latter doesn't always show to be true in practice, studies show that customers are more concerned about sustainability[14]. The main issue is that customers are not aware that CEBs are an option. For this to be viable, there needs to be a strong marketing strategy.

Direct competition is non-existent. There are no real estate development companies that build with CEBs. Most CEB buildings are either self-built or built by small local builders who specialize in that technique. There are, however, other real estate developer competitors that are heavily investing in other sustainable methods like wood. Vanguard Properties[15] is an example of a company already developing wooden buildings in Portugal.

In terms of cost analysis, several factors hinder its accurate prediction. Building costs have increased dramatically in the past few years in Portugal, being now at an average of 1.495€ per square meter[16]. Engineers argue they will continue to rise, especially due to the rise in cement prices. Due to its unsustainability, it will tend to become more expensive as carbon taxes and regulatory pressure grows. Cement's growing price and the possibility of free soil lead to CEBs construction being cheaper to build. Nevertheless, new machinery is needed to produce the blocks. A set of one soil mixer and one hydraulic press costs 200.000€. They produce 1 block every 6 seconds, which adds up to around 4.000 blocks a day (enough blocks for one medium house). The other costs associated with this are the cost of fuel and the cost of transporting the machinery to the construction site. In addition to this, the company would have more expenses

related to training and employing knowledgeable workers, as well as more investment in advertising needed to change customers' negative perceptions of this technique.
Permit costs and insurance of CEB houses might be higher due to the absence of CEBs from building regulations, although it is unclear how much higher. To better analyse and discuss the financial feasibility, the team decided to consider that the price difference of building with CEBs varies between -10% and +20% when compared with the conventional construction technique the company uses.

Research Conclusions

Upon concluding their research, the innovation team at Lusitano Developers convened to assess their findings and chart a proposal for a course for the future. The potential for a sustainable business model using Compressed Earth Blocks (CEBs) was unmistakable, prompting unanimous agreement within the team that this transformative shift could indeed be feasible. Identifying key areas for change, the team pinpointed critical components for a successful transition. First and foremost, they recognized the need to overhaul construction materials and suppliers, embracing a new paradigm of sustainability. Additionally, upskilling the workforce was a fundamental requirement, ensuring that the company's staff would be adept at implementing innovative construction methods. Furthermore, a comprehensive revamp of the marketing strategy was deemed necessary, aligning it with the principles of eco-friendly construction and reaching out to a consumer base increasingly inclined towards sustainable living.

With their findings and conclusions, the team formulated a Business Model Canvas, as well as a Transition Plan. The team agreed that the conventional BMC could not capture the social and environmental impacts of a business. Thus, Rachel decided to use a tool that has been designed specifically to consider sustainability performance – the Flourishing Business Canvas[17]. This tool is an adaptation of the conventional BMC that includes 3 layers (environment, society and economy) and 17 questions that help innovate and design a holistic business model (Figure 4).

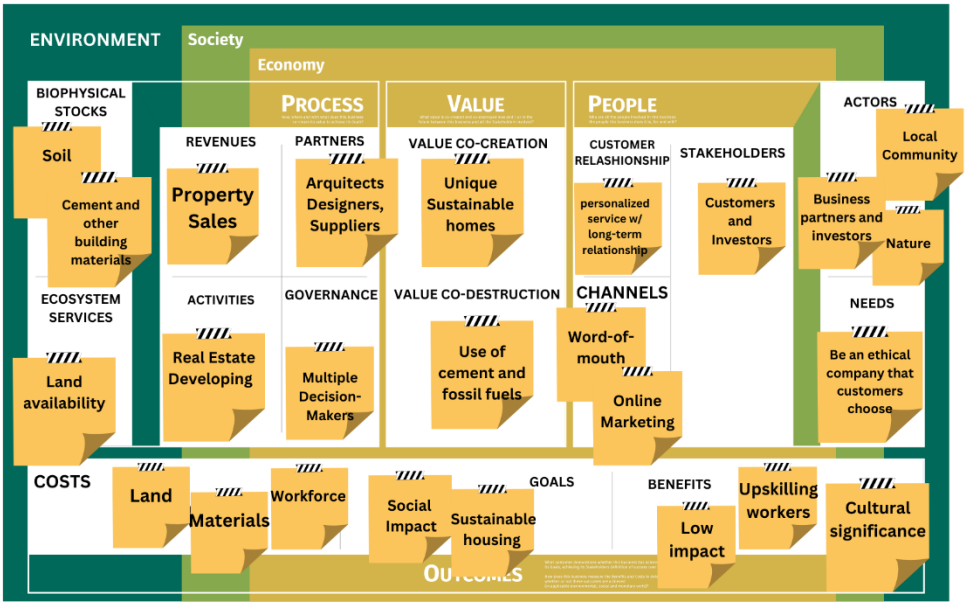

Figure 4 - Flourishing Business Model Canvas. By: Author

The First Board Meeting

The day arrived. Rachel and the innovation team were ready to present their findings in the meeting with the board.

It took Rachel 30 minutes to show the product of the innovation teams' 6-month-long research. After the presentation was concluded, the room fell into a hush. Rachel could feel the tension as the board members looked at each other.

Michael broke the silence by congratulating the team and expressing his excitement.

"*I believe this can be the future, I see its potential and I know Lusitano Developers is the perfect company to lead the market on CEBs.*"

Michael was positive, but not everyone shared his opinion. Most were worried about the feasibility of this business model.

The following were the opinions of each member:

Michael – "This is a visionary idea! Let's invest in changing our business model and make CEBs our only construction method. We can become a hybrid organization, possibly a B Corp and be on the front line of innovation! We will be known and recognized for our mission! For the maximum impact, we should do the full transition as fast as possible!"

Tania – "CEBs are the innovation we needed, however, the risks associated with CEBs are clear and fully transitioning a company this size is unrealistic. Let's focus on small gradual changes for the next years until CEBs account for around 5% of our projects."

Investor 1 – “There is no market in Portugal for this! It’s risky and we cannot be too adventurous right now, I think we should continue as we were doing while trying our best to implement some small, manageable, sustainable initiatives.”

Investor 2 – “This is revolutionary! We can turn this into another revenue stream – let’s teach other companies this method and create a consultancy arm of the business.”

The room was divided, but a decision had to be made.

Teaching Notes

Introduction

Environmental sustainability, social responsibility and impact are topics increasingly discussed in business. As debates on climate change and societal issues develop, the sustainability trend grows, and businesses are thus required to find ways to position themselves differently in this changing world.

For several years, government bodies have been in the process of defining environmental and social problems and setting clear guidelines for businesses to comply. Recently, in 2020, a new framework has been created and adopted by the European Union.

The EU Taxonomy Regulation[18] was created as part of the European Union's sustainable finance agenda. It is a significant regulatory framework aimed at promoting sustainability in financial markets and guiding businesses and investors toward more environmentally sustainable activities. The objective of this system is to facilitate a transition to a greener economy by providing a common classification system for what is and is not considered a sustainable activity. By outlining specific environmental criteria for businesses and investors to determine whether their activities align with sustainability objectives, the EU taxonomy can mitigate greenwashing and at the same time promote a sustainable finance ecosystem. The EU taxonomy will pair with other disclosure requirements[19] that together will pose significant consequences for businesses. These include 1) Compliance requirements - businesses above a certain size are required to assess their activities against the taxonomy criteria and eventually change their activities to comply with it. 2) Access to Capital - businesses that align with the EU taxonomy are more likely to access responsible investors, 3) Transparency - Businesses will need to provide standardized sustainability reporting, 4) Market Competitiveness - businesses that fail to adapt are more likely to be left behind by investors and customers.

This case study shows how a hypothetical company in one of the most polluting sectors in the world chooses to deal with the changing regulatory landscape. Specifically, this case study aims to create an in-class discussion about the feasibility of established businesses transitioning to a more sustainable business model. The goal is for students to position themselves in the shoes of the decision-makers in the company and critically think about sustainable innovation in an established business and how that process might look.

Case Summary

The case starts by presenting Rachel, the chief innovation officer of a real estate development company. She realizes the practical consequences of the EU taxonomy system and other EU sustainability regulations at a conference she attends. Currently, despite the high amounts of emissions associated with the company's activities, "Lusitano Developers" is participating in various sustainability initiatives. Despite this, what Rachel saw in the conference was that those initiatives alone are not future-proof. She proposes to her superiors a trajectory change, a revamp of the business model that could potentially mean transforming the Lusitano Developers into a hybrid company. She researches different construction methods and comes across the Compressed Earth Block (CEB) technique. This technique is a new spin on a traditional building technique used for centuries in Portugal, and which is seeing a resurgence in other European countries due to its sustainable nature[20]. Rachel meets with the directors to discuss how the company should face the changing regulations and trends and proposes the adoption of this eco-friendly technique. The board is intrigued by this idea and decides to ask her to lead a 6-month research on the feasibility of transitioning to building with CEBs. Rachel does her research on financial feasibility and social and environmental impact. After the research period, Rachel and the innovation team presented a business model innovation proposal to the board members.

Discussion

There are 3 topics to be discussed in the case study:

1. How feasible is the "Compressed Earth Blocks" business model proposed by Rachel and the innovation team?
2. What are the tensions and challenges an established business like Lusitano Developers will have when transitioning to a sustainable business model?
3. Should the board of directors of Lusitano Developers decide to shift its business model? If so, how should the transition be led?

Learning Outcomes

This case study and its discussions are intended to help students:

1. Recognize the challenges of established companies transitioning to more sustainable business models.
2. Understand the Sustainable Business Model Innovation theory.

3. Critically think about the feasibility of a business model.

Course Applications

This case study on "Lusitano Developers" serves as a versatile resource suitable for classes in Innovation and Entrepreneurship, Strategic and Sustainable Management, Business Ethics, and Marketing and Branding. Its rich content allows students to explore transformative shifts, strategic decision-making, ethical considerations, and the adaptation of marketing strategies in the context of sustainable business model innovation. This flexibility makes it a valuable tool for educators seeking to engage students across diverse disciplines.

Theory and Framework

Business model innovation (BMI) is the process of re-thinking and re-designing the way a business generates value, delivers products or services, and captures revenue. It is a crucial part of securing a competitive advantage and exploring new growth opportunities. The recent sustainability-focused academic research has led to the growing discussion on Sustainable Business Model Innovation (SBMI). Theorists stress the importance of business models to drive sustainable consumption and production and express how business model innovation can also support eco-innovation (Lüdeke-Freund, 2010). Theory in SBMI is still in its infancy, however, there is a consensus among academics and professionals that sustainability cannot be embraced fully without innovation (Shakeel et all). According to Ferlito and Faraci (2022), sustainable business model innovation (SBMI) is characterized as a transformation in a company's operational approach aimed at generating positive outcomes or mitigating adverse effects on the environment and society.

In recent years, companies have encountered a challenge known as the "double externality problem". On one hand, eco-innovation generates positive externalities that benefit society and the environment but often fail to translate into substantial profits for the innovating company. On the other hand, the negative externalities resulting from non-eco versions of products or technologies often go unchecked, without companies facing any significant consequences for their detrimental impact. This dilemma placed eco-innovations at a competitive disadvantage in the market, discouraging environmentally responsible practices. However, recently, regulatory bodies have created legislation that is making unsustainability expensive, which in turn is forcing businesses to transition to more sustainable activities.

Schaltegger et al 2011 express that positive environmental and social impact should go hand-in-hand with a positive business effect. Instead of incorporating a few sustainability initiatives in the "business as usual", companies should aim to create profit "through" having a positive impact on the planet and people. In other words, positive environmental and social impact should come as a direct consequence of the business activities. To accomplish this goal, addressing these issues goes beyond making incremental improvements and implementing technological fixes; instead, a fundamental shift towards innovative socio-technical systems is necessary (Köhler et al.).

When an organization tries to innovate its business model to balance economic, social, and environmental considerations, tensions inevitably arise. Companies must navigate conflicting priorities and make decisions that align with their values, stakeholder expectations, and the broader goals of sustainability. The goal should not be to avoid or eliminate these tensions but to accept, embrace and use them as a driver for innovation (Hahn et al, 2018). Hahn (et al, 2015) developed a systematic framework for the analysis of tensions in corporate sustainability. This framework can be used to identify and characterize the tensions in an existing organization. The tool analyses the economic–environmental–social triad within three different dimensions: (1) level, (2) change, and (3) context.

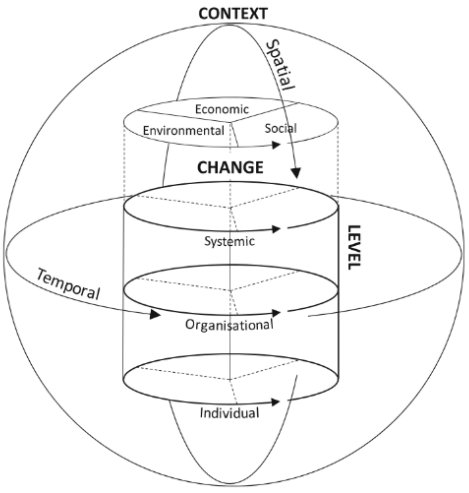

Figure 5 - Figure 5 - Systematic framework for the analysis of tensions in corporate

Identifying and characterizing the tension allows for more concrete strategies to address them. The class material created alongside this case study aims to facilitate discussion amongst students and invite them to analyse and create strategies for the tensions present in the company Lusitano Developers.

Class Plan

Section	Discussion Topic	Teaching Activities	Duration	Details	Learning Outcomes
10 min introduction					
Divide the class into groups of 5 or 6					
1	Discussion on the BM Feasibility and Tensions in Sustainable BMI	8 Discussion Questions	00.20.00	In their groups, students discuss the questions.	Critically analysing a business model
10 min Whole-Class Debrief					
2	Transition Ideation	Brainstorming actionable steps and strategies	00.20.00	Students design the timeline in their groups and afterward present them to the class	Encourage creativity in generating a business plan
10 min Whole-Class Debrief					
3	Decision-Making Process	Play Role Activity	00.20.00	Students create a fictitious board meeting where each of them defends one opinion to reach a decision.	Strategic Decision Making And Debating skills

Teaching Support

This class is divided into 3 sections: Discussion Part 1, 2 and 3. Each part is accompanied by a worksheet, each containing one exercise for students to work on. Part 1 focuses on discussing SBM feasibility and tensions; Part 2 focuses on the transitioning of a BM; and Part 3 focusses on decision-making.

Discussion Part 1

The exercise in "Part 1" contains 8 questions designed to create debate and discussion around the feasibility of the BM at hand. In this exercise, the students are invited to discuss the feasibility of the BM presented in the case study. Students are expected to identify the BM's key challenges and flaws, as well as its competitive advantages and opportunities. The exercise also includes broad questions that aim to spark students' curiosity on topics such as "Government engagement in the market" and "Characteristics of Hybrid Organizations". This exercise also includes questions related to the CSR Paradox and Tensions that arise in

sustainable business model innovation. These questions were designed to lead students into identifying tensions in the particular case of Lusitano Developers, as well as brainstorming strategies to address them.

This exercise is important because it allows students to discuss and interchange their ideas and opinions with each other in small groups freely and safely. Students are expected to develop their critical thinking by engaging in discussion on relevant theoretical topics related to SBMI. For better outcomes, teachers are encouraged to engage in student group discussions and listen to their thought processes. After the discussion time is over, the teacher can mention to the whole class interesting thoughts and opinions they heard in group discussions.

Discussion Part 2

The exercise in Part 2 creates a moment for students to position themselves as part of the innovation team at Lusitano Developers. Students are encouraged to brainstorm and be creative to design a realistic and innovative transition plan, that takes Lusitano Developers from their current business model to the business model the team presented in the Board meeting. An exercise like this allows students to critically analyse the feasibility challenges and tensions they identify in the previous exercise and now explore different strategies to address them. Students can create a checklist plan, a timeframe, or a step-by-step itinerary. After each group develops their transition proposal, the teacher can choose a few groups to present to the class.

Discussion Part 3

The final part is a play role activity that invites students to position themselves as part of the board members – the decision makers. The opinions of the board members are shown in the final section of the case study. In groups, students must choose which of the opinions they will impersonate and then defend their position. Students are expected to convince each other why their opinion is realistic and credible and argue for or against the opinions of others. The goal of this exercise is to simulate a real discussion between decision-makers, as well as encourage students to put themselves in the perspective of opinions they might not agree with. The teacher should mention that there is no right or wrong answer, but students will be rewarded for how convincing their argument is.

Worksheets

Discussion Part 1 - Established Businesses Transitioning to SBM – Organizational Tensions

Discuss amongst your classmates the feasibility of the business model you have designed, and the logistics associated with transitioning:

1) What are the main challenges this business model faces? Can these challenges be overcome? How?
2) What are the key aspects that need to exist for this business to succeed?
3) Why would a company like Lusitano Developers want to become a hybrid organization? And why would it decide not to become hybrid? To answer this think about what it takes to be considered a hybrid organization and how business models differ.
4) What challenges would Lusitano Developers face when transitioning to this Sustainable Business Model compared to a start-up starting from zero?
5) Think of other sectors, where can you see other companies shifting their business model into more sustainable ones? How are they harnessing their strengths and addressing their weaknesses?
6) Should governments enforce regulations that mandate businesses to adopt environmentally and socially responsible practices, or is it more effective to rely on voluntary initiatives and market forces?
7) What types of tensions will occur as Lusitano Developers shifts to a more sustainable business model?
8) What strategies can be implemented to address the tensions you mentioned?

Discussion Part 2 – Transition Plan Ideation

Transition Plan Creation

Besides the Business Model presented in the Board meeting, the innovation team must also present to the board a go-to-market plan. Imagine you are part of the innovation team at Lusitano Developers, and you want to present to the board the plan for the following years. A transition plan, with actionable, realistic steps can the company take to achieve the long-term business model goal. How can Lusitano developers get from their current BM to the BM you have designed in the previous exercise?

Choose a roadmap and think about 5 to 10 actionable steps the company should take.

Discussion Part 3 – Decision-making Process.

Play Role Activity

Imagine you are part of the Lusitano Developers' board, and the innovation team presents to you the BMC and go-to-market plan you just designed. Create a fictitious board discussion and agree upon a decision. Should Lusitano developers start investing in transitioning to CEBs or not?

Each group member must impersonate one of the opinions of the board members (shown at the end of the case study) and defend their position. Students are free to come up with different opinions.

Students' Expected Responses and Debates

In the first exercise, students are expected to refer the following topics for each question:

Question 1 – For example, 1) The aversion to change in the construction sector, 2) Changing people's negative perception of this technique, 3) Regulatory challenges related to construction requirements and 4) Lack of qualified workers.

Question 2 – For example, An innovative marketing campaign to change customers' negative perception of this building technique. The campaign could be focussed on educating customers on the negative impact of mainstream construction.

Question 3 – Hybridity comes with advantages and disadvantages for a business. Students are expected to refer that hybrid organizations have access to funding options, their mission-driven attracts loyal employees and customers, and overall, usually have a positive reputation that serves as a competitive advantage. Some disadvantages could be the fact that hybrid organizations need to navigate complex and evolving regulatory landscapes related to sustainability, which can pose legal and compliance challenges. In addition to this, sustainable initiatives might pose short-term economic sacrifices. Overall, they have different value propositions, legal structures, and revenue sources. The obstacle could be the transition in itself – established businesses are "stuck" in their already over-systematized operations, and shifting can result in a massive disturbance.

Question 4 - Students are expected to mention that established businesses must manage customer and stakeholder expectations and think about how they would react to a transition. They must consider their already established brand image and how employees must upskill. Other factors established businesses must consider are legacy commitments and managing the existing ongoing operations. Investors who have a powerful position might be against change and hinder the transition.

Question 5 - Students can refer, for example, to the car industry, which in recent years has invested in transitioning to electric vehicles.

Question 6 - Government regulations are essential for addressing overlooked negative impacts and ensuring accountability through standards and enforcement. They protect consumers by providing accurate information about product and service impacts. Voluntary initiatives allow businesses flexibility to innovate and respond to market demands. The market itself, driven by consumer preferences, becomes a strong incentive for businesses to adopt sustainable practices. This approach avoids excessive bureaucracy and reduces compliance costs compared to rigid regulations. Balancing both regulatory and voluntary approaches can be key to effective and flexible sustainability measures.

Question 7 – 1) Lusitano Developers might face tensions in convincing stakeholders, including investors and shareholders, about the longer return on investment associated with sustainable construction methods compared to conventional approaches. 2) Lusitano Developers might innovate with cutting-edge sustainable construction materials or techniques, but they need to ensure compliance with local building codes and regulations, which might not be fully aligned with these innovations. 3) Lusitano Developers may face tensions between maximizing profits for shareholders and fulfilling their purpose of contributing to environmental sustainability. For instance, investing in eco-friendly features might initially increase costs, challenging short-term profitability goals. 4) Lusitano Developers may experience tensions in aligning housing designs with existing consumer preferences, which may be more accustomed to conventional building aesthetics. Simultaneously, the company needs to invest in educating consumers about the benefits of CEBs and sustainable living to shift demand over time. 5) Lusitano Developers may face tensions between competing with other real estate developers for market share and collaborating with industry peers to advance sustainable construction practices. On one hand, they compete for customers, but on the other, collaboration may be essential for sharing best practices, addressing industry challenges, and collectively influencing positive change.

In the second exercise, students are expected to present a transition plan. What follows is a proposal of a transition plan students might present:

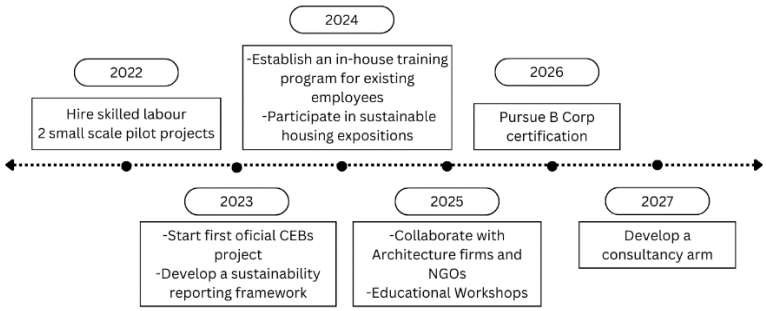

Figure 6 - Transition Plan Suggestion. By: Author

In the decision-making part of the discussion, students should explore and debate the critical decisions that "Lusitano Developers" must make in response to the challenges and opportunities presented in the case. Here are the key points students must discuss when justifying their position:

- Discuss the potential benefits (such as environmental sustainability and market differentiation), and weigh the associated challenges, (like sourcing, cost, and acceptance) of adopting CEBs.
- Compare the risk of changing the business model with the risk of taking no action.
- Discuss the challenges and benefits of investing in workforce development and how it contributes to the long-term success of the business.
- Evaluate the decision to overhaul the marketing strategy to emphasize sustainability.
- Explore the implications of regulatory compliance on the business and its positioning in the market.
- Discuss how the decisions made impact the company's profitability, market competitiveness, and overall success.
- Discuss strategies for continuous adaptation to evolving regulations, market dynamics, and consumer expectations.

In conclusion, the case study of "Lusitano Developers" provides a thought-provoking exploration of sustainable business model innovation in the real estate sector. Through Rachel's visionary proposal, students navigate the complexities of decision-making, stakeholder management, and the delicate balance between economic viability and environmental responsibility. The case offers students an active role in unravelling the considerations that define a business model's evolution. This case study serves as a valuable platform for students to apply theoretical concepts, refine decision-making skills, and deepen their understanding of businesses' role in shaping a sustainable future.

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Endnotes

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