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

SEA!D – PROVIDING A SUSTAINABLE AND INNOVATIVE SOLUTION FOR THE CARD INDUSTRY

PART I: MARKET AND CUSTOMER VALIDATION OF RECYCLED PRODUCTS WITHIN THE CARD INDUSTRY

Carla Christa Jordis

–

PART II: PROBLEM SOLUTION FIT: VALIDATION OF THE ECOLOGICAL AND ECONOMIC FEASIBILITY OF THE SEA!D BUSINESS MODEL

Lisa Marie Geier

Work project carried out under the supervision of:

Miguel Alves Martins

16-12-2021

Note: This work project consists of two individual parts (Part I and Part II). Whereas Part I: *Customer and Market Validation* was written by Carla Christa Jordis, Part II: *Business Model Validation* was compiled by Lisa Marie Geier. The residual parts were developed by both authors.

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

SEA!D – PROVIDING A SUSTAINABLE AND INNOVATIVE SOLUTION FOR THE CARD INDUSTRY

PART I: MARKET AND CUSTOMER VALIDATION OF RECYCLED PRODUCTS WITHIN THE CARD INDUSTRY

CARLA CHRISTA JORDIS

Work project carried out under the supervision of:

Miguel Alves Martins

16-12-2021

Note: This work project consists of two individual parts (Part I and Part II). Whereas Part I: *Customer and Market Validation* was written by Carla Christa Jordis, Part II: *Business Model Validation* was compiled by Lisa Marie Geier. The residual parts were developed by both authors.

Abstract

This work project depicts the creation of an early-stage startup within the ecosystem of Nova SBE, introducing an innovative solution, which allows card manufacturers and issuing companies the opportunity to offer a sustainable plastic card made from upcycled fishing nets. It aims to analyse market acceptance and consumers' willingness to pay for recycled products and hence validating the proposed business model.

Applying a combined methodology of quantitative and qualitative research, this work reveals industry insights that helped sharpen its value proposition towards taking the antagonistic asset of fishing nets and turning it into something valuable.

Keywords: *Entrepreneurship, Customer Acceptance, Willingness to pay, Sustainability, Circular Economy, Ocean pollution, Plastic Pollution, Innovation, Environmental Impact*

Abstract – Part I: Market & Customer Validation

This work project outlines the validation of the market and customers within the card industry. With the end goal of introducing an innovative and more sustainable solution for plastic cards, it aims to analyze market acceptance and consumers' willingness to pay for recycled products to derive its overall market potential further.

Applying the triangulation research design in combining qualitative and quantitative methods reveals results that prove market acceptance and highlight the factors that influence the consumer' WTP.

It will further serve as the fundament of validating the ecological and economic feasibility of the *SEA!D* business model.

Keywords: *Smart Card market, Plastic industry, Market validation, Customer acceptance, willingness to pay, Recycled products*

Table of Contents

Table of Abbreviations

Business Model	BM
Chip Enabled Card	CEC
Gross Domestic Product	GDP
Higher Education Institutions	HEI
Near Field Communication	NFC
Non Governmental Organisation	NGO
Not Willing to Pay	NWTP
Not Willing to Switch	NWTS
Polyvinyl Chloride	PVC
Search Engine Marketing	SEM
Search Engine Optimization	SEO
Subscriber Identity Module	SIM
Sustainable Development Goal	SDG
Willingness to Pay	WTP
Willingness to Switch	WTS

List of Figures

1. Introduction

It is well established that the pollution of the world's ocean is an increasing and pervasive issue (Thomas, Dorey, & Obaidullah, 2019). However, around 8 million tons of plastic continue to be disposed of in the marine ecosystem annually (IUCN- International Union for Conservation of Nature, n.d.). If this trend continues, there will be more plastic than fish in the ocean by 2050 (UN Environmental Programme, 2018). One of the deadliest forms of this plastic debris is fishing gear created to capture marine creatures. It is estimated that 640,000 tons of "ghost gear" end up in the oceans annually (Thomas et al., 2019) (Appendix A: Numbers & facts ghost nets).

The time to act is now, and everyone is held accountable. As Sir David Attenborough states: *"How could I look my grandchildren in the eye and say I knew what was happening to the world and did nothing."* (Attenborough, 2007)

SEA!D is on a mission to clean up the oceans by taking an antagonistic asset and turning it into something valuable. Its story starts in early 2021 in a course at Nova School of Business and Economics (SBE), where a group of students developed an innovative business idea. Its **core product** is a redefined, eco-friendly student identification card made from recycled fishing nets. *SEA!D* was created to pursue the **mission** to reduce net waste in the harbours and prevent ghost fishing on the Portuguese coast. By recycling fishing nets, the goal is to ultimately protect the marine ecosystem.

After completing the course, two group members decided to explore this idea further. From prototyping in May to taking part in the Blue Bio Value Ideation program in late 2021, the founders continuously focused on further developing and enhancing the product and identifying alternative market opportunities.

2. Research Question, Structure and Methodology

2.1 Research Question

Derived from the problem briefly described in the introduction, this thesis analyses the feasibility of *SEA!D's* social business model and the validation of the market side, including the customer acceptance and willingness to pay for recycled materials.

Applying a combined methodology of quantitative and qualitative research, the analysis will provide answers to the following research questions:

1. *Market & customer validation - the effect of products made from recycled material on the consumer's acceptance and willingness to pay (WTP) for these types of products.*
2. *Ecological and economic feasibility of social business models using the example of SEA!D.*

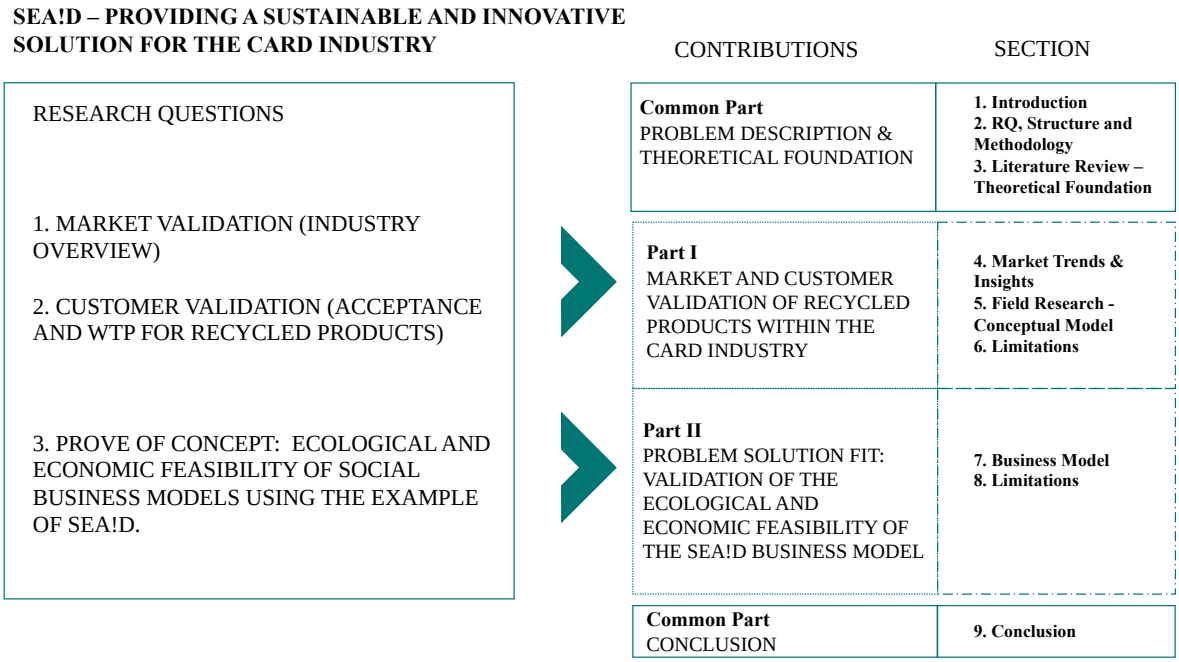


Figure 1: Thesis Structure Overview

The first three sections of this work focus on laying out the theoretical landscape and describing the current state of evidence. Moreover, the thesis highlights the importance of the lost gear problem, the underlying reasons for using PVC plastic, and society's position towards recycled products. Additionally, it provides a brief overview of the concept of business models and the criteria to assess *SEA!D's* feasibility.

Within **Part I**, the market potential will be evaluated and customers examined. Data from different markets are analysed to narrow down the global market to those we seek to target with our product. The conceptual framework and field research will provide an overview of customer acceptance and willingness to pay for recycled materials. Analysis of the collected data will explain the results and highlight the factors that influence the WTP. Finally, limitations will be identified, and key findings and implications for further work on the *SEA!D* project will be derived.

Part II focuses on applying the triangulation research design[1], in combining qualitative and quantitative insights that will serve as the basis to propose the business model and ensure validation of the project's feasibility. Besides outlining its core business, this involves understanding the financials, the involved risks, and the future roadmap. Then, using the criteria proposed by Haaker et al., the business model will be evaluated accordingly.

Finally, an overall conclusion will be drawn.

[1] "Triangulation is often used to describe research where two or more methods are used, known as mixed methods." (Heale & Forbes, 2013)

2.3 Methodology

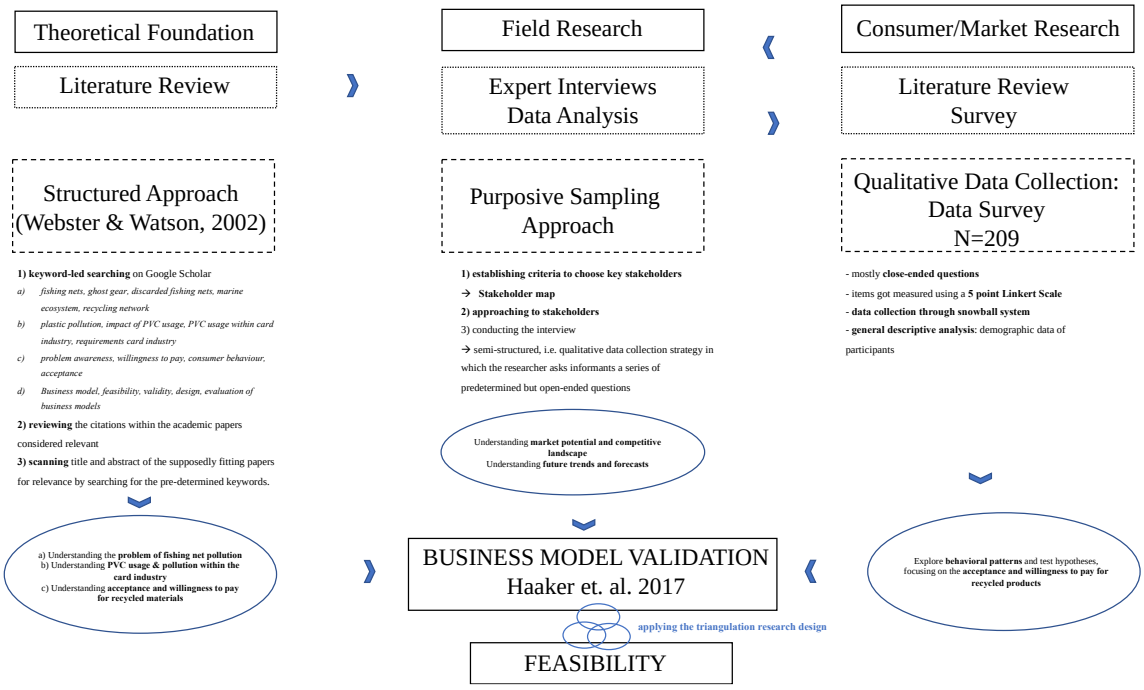


Figure 2: Methodology Structure

In terms of methodology, we combined three different approaches to get an overall perspective of the project from a 360-degree angle (Figure 2). First, in order to lay out the theoretical landscape of the problem and current status quo, we performed a comprehensive literature review. Next, expert interviews were conducted to gain market insights and access to relevant information. Lastly, we ran an online survey to explore consumer behaviour, including acceptance and willingness to pay for recycled products.

2.3.1 Literature Review

We adopted the structured approach devised by Jane Webster and Richard T. Watson (2002), i.e., a three-step process to determine the source material for a systematic literature review. We focused on steps one and two of this process for our literature reviews.

Step one entails the in-depth inquisition of peer-reviewed journals. To find journals and therein contained articles dealing with our subject area, we employed a keyword-led search on Google Scholar. For our literature review, we entered words such as “ghost gear, discarded fishing nets, marine ecosystem, recycling network, sustainable consumption, consumer behaviour, recycled plastic, card industry, upcycling, consumer acceptance, willingness to pay, plastic pollution awareness, smart card market, market validation, business model feasibility”. Step two of the structured approach suggests 'go backwards', i.e., reviewing the citations within the academic papers considered relevant in step one. By following this process, we were able to extend our literature base rapidly.

In addition to these two steps to find and review literature germane to our topic, we followed another approach. If an article seemed particularly promising, we referred to other publications of the same author and references given by Google Scholar. We decided whether or not to thoroughly read an article that we preliminary regarded pertinent by implementing the method proposed by Scott Newbert (2007). He recommends scanning the title and abstract of the supposedly relevant papers for relevance by searching for pre-determined keywords again. If neither title nor abstract includes at least one of the keywords, the article should be neglected within the literature review. We followed this technique but did not only browser the title and abstract for the keywords but the entire article.

In summary, we leveraged the structured approach by Webster and Watson (2002) and our adapted approach to discover relevant literature that addresses the problem of fishing gear in the ocean, plastic waste in general, the customers willingness to pay for recycled material, and methods to design a business model and the evaluation of its feasibility.

2.3.2 Expert Interviews

Secondly, qualitative expert interviews with executives from different sectors such as recycling factories, card manufacturers, financial institutions, and best practices were conducted (Appendix AD: Interview partner overview). This allowed us to derive learnings for *SEA!D* to gain market insights and determine recommended actions to develop a viable business model.

We decided to use the purposive sampling approach to find the relevant experts. Purposive sampling is "used to select respondents that are most likely to yield appropriate and useful information" (Kelly, 2010) and can be interpreted as a valuable approach to identify and select interviewees that will make use of limited research resources in an effective manner (Palinkas et al., 2015).

We decided to adopt this strategy based on the assumption that, given the purpose and outcome of the study, different kinds of experts may hold various and essential views about the ideas and issues when confronted with a question and therefore need to be included in the selected sample (Mason, 2002; Robinson, 2014; Trost, 1986).

The first step of our purposive sampling approach was to establish criteria for choosing key stakeholders. Then, we started looking at the key activities of the business model and noted down stakeholders whom we considered relevant to us. We also considered criteria such as proximity to Lisbon, already established relations, reputation, and specific knowledge within the field. In order to get a structured overview, we then developed a Stakeholder Map (Appendix B: Stakeholder Map).

We sent an email introducing ourselves and the project's core to approach the respondents. If the response was positive, we scheduled an online interview call with a duration of approximately 15-30 minutes (Appendix C: Sample with the written text: Email to Interview Partners). In total, we interviewed 29 experts from different industries and fields of expertise ranging from recyclers to plastic card producers, injection moulding firms to NGO's, but also best practices and potential customers such as financial institutions and universities (Appendix AD: Interview partner overview).

We chose the interviews to be semi-structured, i.e., "qualitative data collection strategy in which the researcher asks informants a series of pre-determined but open-ended questions". (Ayres, 2008, 810). Although the interview guide has a certain thematic structure and contains pre-formulated questions, it is not bound to a given order, one of its main advantages and enables the generation of more information (Ayers, 2008; Bogner, Littig & Menz, 2014). The guideline was primarily drawn up by the recommendations of Bogner et al. (2014).

2.3.3 Survey

On the consumer side, an online survey was conducted to explore behavioral patterns of potential consumer and test hypotheses, focusing on the acceptance and willingness to pay for recycled products. The detailed survey methodology will be explained further in section 5.1 Survey Methodology.

Having elaborated on the compilation process of the methodology, we will now dive into the theoretical part of the thesis.

3. Literature Review – Theoretical Framework

This section outlines current and relevant literature to understand the causes and the extent of the problem at hand. It will summarise the most important findings regarding the causes of pollution through fishing gear and the lack of prevailing solutions. It will also provide in-depth insights into the smart card industry. In addition, key findings from previous studies on the willingness to pay for recycled materials are consolidated, hypotheses are formulated, and concepts of business models are outlined to answer the research questions posed.

3.1 Pollution through Fishing Gear

In Europe, fishing gear is among the top ten marine litter items found on beaches, accounting for 27% of the total waste of the continent (Rethink Plastic Alliance & Break Free from Plastic, 2019). In Portugal, *Brigada do Mar* estimates that 85% of their collected ocean waste comes from fishing activities (Acciaioli, Brigada do Mar, 2021, Appendix AD1). Miguel Lacerda from *CascaisSea* confirms that around 80% of the marine litter found along the Portuguese coast is from fishing (Lacerda, CascaisSea, 2021, Appendix AD2).

3.1.1 The Impact of the Fishing Net Pollution

The socio-environmental impact of this problem is devastating and multifaceted. Research states that the entanglement of animals due to ghost gear is the most significant marine debris threat to seabirds, turtles, and marine mammals (Blue Circular Economy, n.d.). "Ghost gear" can be referred to as any discarded, lost, or abandoned, fishing gear in the marine environment. This gear continues to fish and trap animals, entangle and potentially kill marine life, damage the marine habitat and act as a hazard to navigation (NOAA, 2021). Degraded habitats lower the resilience of marine creatures and reduce their ability to survive (Thomas et al., 2019). Those effects eventually result in (1) biodiversity loss and (2) economic and social costs. (1) According to research, ghost gear is

responsible for harming 66% of marine mammal species and half of the seabird species (Thomas et al., 2019). (2) Overall, the reduction in sea life stocks lowers the catch in the fishing industry. The diminishing yield is threatening the livelihoods of local fishermen and their families.

3.1.2 The Root Causes of the Fishing Net Pollution

Identifying the problem's source is paramount when trying to solve the previously described impacts (Astrup et al., 2018) (Appendix D: Problem Tree Fishing Net Pollution). Within fishing, net pollution causation can be understood with two questions: (1) *Why do nets end up in the ocean* and (2) *Why do nets remain in the ocean*.

(1) *Why nets end up in the ocean: Lost or intentionally discarded*

According to a study conducted by Kelsey Richardson, 5.7% of all fishing nets, 8.6% of all traps, and 29% of all lines vanish around the world each year (Richardson, 2019). Those are either lost due to environmental factors (around 88%) or intentionally discarded (around 12%), as there remains a lack of awareness of the direct consequences on marine ecosystems (OSPAR Commission, 2020). Ben Kneppers, the co-founder of Bureo, states that fishers usually need a new fishing net every eight months to two years (Kneppers, Bureo, 2021, Appendix AD3). At this point, they need to get rid of their old net and buy a new one. Proper disposal in Portuguese harbours is complex, and waste management is still very ineffective: Frequently, Ports have no disposal points, or fishermen must pay for removal. Hence, they drop the fishing nets into the shore (Lacerda, CascaisSea, 2021, Appendix AD2).

(2) Why do the nets remain in the ocean: Lack of incentive and sanctions

The fishing industry in Portugal is highly fragmented, as most of the businesses consist of one man and one boat (Tabaio, DocaPesca, 2021, Appendix AD4). Those fishermen do not possess the physical and financial resources to remove the nets from the ocean, which are heavy to lift and scattered into the sea. Besides that, they lack incentives for collection as the nets have no value on the market. Moreover, the fragmentation makes it difficult for local authorities to regulate and monitor the disposal of fishing nets. Those fishing nets remain for up to 600 years in the marine environment, which means they accumulate in the ocean (Thomas et al., 2019).

3.1.3 Existing Solutions and Prevailing Impact Gaps

Until now, solutions to the above-described issue remain scattered (Appendix E: Impact Gap canvas). NGOs raise awareness on ghost fishing and marine ecosystem conservation through ocean cleanups while establishing local networks for fishing net collections. In the business sphere, companies mainly sell small-scale lifestyle products with only little effect on the overall issue (e.g. sunglasses of Bureo). *DocaPesca* sets up return bins at local harbours to support the fishing industry. However, only a few specialised recycling facilities offer nylon processing from those fishing nets. In summary, each stakeholder group has a different perspective on the issue, solving it in an isolated, small-scale approach.

Consequently, several impact gaps remain. The fishing industry is rarely involved in the established solutions, while ocean cleanups only fight the symptoms of the fishing nets pollution, thereby failing to address the actual root causes (Appendix D: Problem Tree Fishing Net Pollution).

For example, the fishing nets collected by *DocaPesca* at the Portuguese ports end up on the landfill (Simão, Pacto para os Plásticos, 2021, Appendix AD5) as they have no recycling partner.

Moreover, sold products from recycled fishing nets are niche rather than large-scale, everyday products, consequently lacking the potential to create a significant impact.

Hence, this work project depicts the development of *SEA!D*, focusing on tackling the described problem through a new angle. It seeks to substitute the antagonistic good of fishing nets with an already existing product to offer a more sustainable alternative.

3.2 Usage of PVC plastic within the Card Industry

Most cards worldwide are made out of plastics - primarily polyvinyl chloride (PVC). According to Thales, 30 million kilogramms of PVC are used every year to produce cards within the banking sector (Thales, 2020).

Its history starts in 1936, when it was first introduced to the market. Whereas until the 1950s it was not commonly used, from the 1960s to the 1980s, production skyrocketed and currently reaches more than 30 million tons per year (Taylor, 1957; Aftalion, 1991). What is neglected in this estimation are the non-PVC components of vinyl products such as plasticisers and stabilisers. The production of pure polyvinyl chloride is currently estimated at around 50 million tonnes per year worldwide (Business Wire, 2021).

Polyvinyl chloride plastic was also the first material used to make ID cards and is until today the most commonly used material for conventional card production. This is primarily due to its low price and good processing properties; however, as environmental awareness increases, its usage decreases (Rankl & Effing, 2002).

3.2.1 The Impact of PVC Pollution

The environmental impact of PVC is tremendous. As the feedstock of PVC is vinyl chloride (which is a known carcinogen), this results in considerable environmental damage.

Additionally, heavy-metal compounds are often processed to meet required properties such as stability (Thornton, 2002).

As Trivedi noted, "the payments industry is a significant contributor to carbon emissions and waste, with plastic cards, their packaging, and the energy used to process electronic transactions contributing to climate change" (Trivedi, 2021).

The production process of cards - whether plastic cards or cards made out of metal - releases additional carbon emissions resulting in even more greenhouse gases in the atmosphere, which absorb and re-radiate the sun's energy.

In combination, besides driving climate change, this process poses hazardous risks for our natural environment (Trivedi, 2021).

When broken down to the card industry, the carbon footprint of the plastic used to make a single card is tremendous. Assuming that six billion bank cards are produced each year, this results in a carbon footprint equivalent to 30 billion plastic bags (Thales, 2021).

3.2.2 The Root Causes of PVC Pollution

In order to understand the root causes of PVC plastic pollution, it is necessary to clarify causation why in the first place, PVC is used within the card industry. Therefore, we examined the question from two different angles by looking at (1) *What makes PVC attractive (Attributes of PVC)* and (2) *Why is there a lack of equivalent alternatives available on the market.*

(1) What makes PVC attractive within the card industry (Attributes of PVC)

Taking a look at the history of PVC, it was always regarded as one of the most convenient and affordable material given the alternatives currently available. Moreover, due to its properties, using PVC made it simple to produce robust, durable plastic cards. This again is essential to meet the purpose of the everyday use of those cards.

For a long time, paper and cardboard cards had been used, lacking the ability to withstand mechanical stresses and climatic effects (Rankl & Effing, 2002).

In addition, PVC offers a wide range of applications and processes, making it suitable for different use purposes (Rankl & Effing, 2002). As Adam Wahler, creative director of A2A studios, stated in a public interview, most plastic cards are made from PVCA because the material gives the rigidity but still retains flexibility (A2A Studio, a Stamford, Connecticut company). Another reason is that the material has been used in the card industry since the commercialisation of plastic cards in the '50s, which brings much experience, expertise, and trust combined with a high value of money (Rankl & Effing, 2002)

(2) Why is there a lack of equivalent alternatives available on the market.

According to Fenella Metz, Business Development & Project Manager at PLASTICS, the next couple of years in the plastic industry will be fraught with challenges such as the lack of viable and affordable alternatives. The lack and use of alternative solutions are mainly caused by recycled material being more expensive than virgin plastic. In addition, recycled material is often associated with "less quality" and more minor attributes such as colour variety, which often deters manufacturers from trying (Metz, PLASTIX, 2021, Appendix AD17).

According to Everard, another reason causing the lack of viable solutions is the lack of awareness about environmental efforts and sustainable development. This does involve sustainable development across the industry and the need to actively include all participants in its achievement (Everard, 2008).

Furthermore, producers have nearly no incentives to use recycled materials instead of PVC (Appendix F: Problem tree: Usage of PVC within the Card Industry).

3.2.3 Existing Solutions and Prevailing Impact Gaps

Currently, there are already some movements towards more sustainable alternatives. Visa and Mastercard, for example, are taking steps to reduce their environmental footprint and are asking their business partners and customers to do the same.

Visa and Mastercard, for example, are taking steps to reduce their environmental footprint and are asking their business partners and customers to do the same. In summer 2020, the card network partnered with CPI Card Group to introduce the so-called "Earthwise High Content Card- made of 98% recycled plastic and designed to reduce waste" (CPI, 2020).

Another company (PayActiv) joined the project and offers Earthwise cards to its customers.

Also, Visa is currently negotiating with several other issuers worldwide, trying to offer eco-friendly cards to their customers. Europe seems to be the pioneer. Some countries, including Ireland and Spain, have already adapted sustainable cards. For example, efforts involved introducing a bio-sourced Visa debit card in Ireland and launching the first credit card made of 100% recycled plastic by CaixaBank.

Also, in 2018, Mastercard established the Greener Payments Partnership with card manufacturers Gemalto, Giesecke+Devrient (G+D), and IDEMIA with the mission to minimize the use of virgin plastic within the process of card manufacturing. As a Mastercard spokesperson pointed out in an email, "the goal should be to encourage all banks to issue more environmentally friendly cards" (Trivedi, 2021).

European banks have strengthened their commitment to issuing environmentally friendly card materials. This trend can be observed not only in Europe but as a global trend movement. The Purchase, a New York-based company, works with British banks HSBC and Starling and Spain's Banco Santander to offer customers eco-friendly cards made from recycled plastic.

Santander is also making efforts towards more sustainable solutions, such as the rollout of eco-friendly cards. Furthermore, having committed to more sustainable and responsible banking in general, the bank is currently promoting this in Europe.

According to a press release in March 2021, by 2025, all debit, credit, and pre-paid cards across Poland, Portugal, Spain, and the U.K. will be made of sustainable materials, such as recycled PVC or corn-based plastic substitutes (Santander, 2021, Appendix AD25).

To conclude, it can be said that efforts, especially in recent years, are already being made at a smaller scale by some companies around the world, but until now, the overall industry has not adapted to the trend yet.

3.3 Customers Acceptance Recycled and Virgin Plastic

Plastic is generally considered a problem for the environment, and recyclability of the product is considered environmentally relevant (Adane and Muleta, 2011; Fernqvist et al., 2015; Otsyina et

al., 2018; Heidbreder et al., 2019). Although some studies did not consider the positive environmental impacts of recycled materials by consumers, other studies showed a clear consumer understanding of the environmental benefits of recycled products (Magnier et al., 2019; Michaud & Llerena, 2010). Given this background, the first hypothesis (H1) can be derived.

H1: Raising awareness and acceptance of usage of virgin plastic is engrained in people's consciousness

A recent study looking at the WTP for marine plastic products indicates that consumers are willing to pay more for a marine plastic product than for its conventional alternative (Magnier et al., 2019). However, a limitation of this study is the direct comparison with recycled plastic that is not derived from marine debris, so it is not possible to clarify whether consumers see value in the recycled material because it is ridding the oceans of trash or because it is a cycle of materials. This leads us to derive Hypothesis 1 for our Field research.

3.3.1 Willingness to Pay a Price Premium for Recycled Material

Looking at current research on WTP for recycled products, it is clear that willingness to purchase a recycled product was estimated to be higher than conventional products in several studies, resulting in an accepted price premium for the more sustainable alternative (Essoussi & Linton, 2010; Magnier et al., 2019). Standard estimates for this price premium for recycled products range from 5-15% on top of the original price for the conventional product (Walcher & Ihl, 2019).

3.3.2 Main Factors that Influence the Behaviour

Although awareness of the harmfulness of plastic to the environment is present, it is shown that consumers continue to purchase virgin plastic due to its convenience and lack of assessable

alternatives (Heidbreder et al., 2019). However, several studies have focused on whether this behaviour depends on the age or the life situation people are in (Wiernik et al., 2013; Heidbreder et al., 2019). While some researchers found no significant difference in the behaviour pattern of age rather than on cohorts and the family situation they were raised in (Katz-Gerroa et al., 2020, Magnier et al., 2019), others found out that their behaviour regarding plastic avoidance is more assertive if their educational qualification is higher (Afroz et al., 2017, Madigele et al., 2017).

Nevertheless, different studies showed younger participants or generations, in general, are more conscious and, regarding their disposable income, are more willing to pay an additional price for recycled or more environmental products (First insight, 2020).

Based on the previous findings and further examining this within our case, the following hypotheses are formulated.

H2: Consciousness' of the usage of plastic does not depend on living situation and demographic factors.

H3: Sociodemographic differences have no influence on the willingness to pay for recycled products

H3a: Intergenerational differences do not influence in the maximum amount they are willing to pay for recycled products

H3b: The current living situation does not influence the maximum amount they are willing to pay for recycled material

3.4 Business Model Evaluation

The term "business model" (BM) "describes the rationale for how an organisation creates, delivers, and captures value" (Osterwalder & Pigneur, 2013). It reflects the assumptions about how a venture will operate, what markets and customers will be targeted, and what value the company will create for its stakeholders (Ovans, 2015, Peter Drucker, 1994). Alexander Osterwalder developed the

nine-part business model canvas, a design method that allows statements about all business areas to be clearly presented (Osterwalder, 2004).

To measure the success of BM design, the concepts of viability and feasibility can be used (DeVos & Haaker, 2008). According to Haaker, Bouwman, Janssen, and de Reuver, feasibility is measured by the availability of the necessary resources such as raw materials, technology, human resources, and funding, and by the fact that there are no regulatory requirements that could get in the way when implementing the business model. Using these variables as reference points could help assess the feasibility of the business model and determine whether the project is realizable and can be implemented in practice (Haaker et al. 2017).

In recent years, social issues have become increasingly important, and the number of social enterprises has been rising, the social component could no longer be ignored, and an additional variable needed to be included (European Comission, 2020). A successful social enterprise can be defined as a business venture providing a solution to an identified and clearly stated problem. Therefore, the additional variable defining social enterprise success is "impact". It must be determined how this value creation will be achieved and how the success, i.e., impact, can be measured. This is achieved by previously defining concepts and variables that will be used to measure the intended impact. Even if the environmental or social performance is in the foreground, and the variables make up social enterprises, financial stability still does not lose its importance (Epstein & Yuthas, 2014).

4. Market Trends and Insights

Within this section (**Part I**), a definition of smart cards will be given to provide an overview of the smart card market and its attractiveness. Subsequently, the smart card market will be categorised to analyse market data and the competitive landscape. Afterward, the findings of expert interviews

with Gonçalo Campos Alves, Card Production and Personalization Unit Director at SIBS and Veit Wittke, Managing Director at TTE Smart Card Circle, a specialist in producing card bodies from environmentally friendly materials, are presented. Finally, a short conclusion is drawn (Appendix AD16, AD20).

4.1 Smart Card Market Overview and Competitiveness

To analyse the smart card market, it is essential to provide a concrete definition of smart cards in the first place. Subsequently, by understanding the various applications of smart cards, the market will be divided into the corresponding submarkets and further examined.

4.1.1 Smart Cards

According to Thales, a "smart card is a small portable computer, usually the size of a credit card, without a display and a keyboard " (Thales, 2021). In general, those cards are used as a form of stored value.

Every smart card has different properties: either a microprocessor or memory chip embedded in it. The chip/microprocessor is equipped with the necessary processing power to enable various applications in combination with the appropriate reader. Application areas range from credit cards to SIM cards that allow social and economic communication, identification purposes, and access control, such as university identification cards and company badges.

Hence, to make this overview easier to follow, we divided the smart card market into two categories as suggested by Rankl and Effing in 2002: memory cards and microprocessor cards (Figure 3).

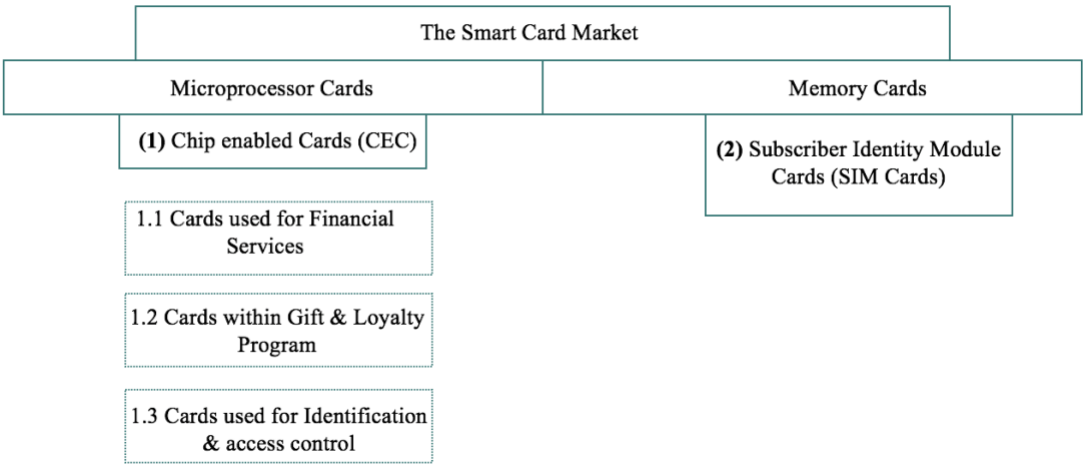


Figure 3: Overview of the Smart Card Market

Micro Processor Cards

The history of microprocessor cards starts in the early 80's in France, where they were first introduced in the form of a bank card. As the properties allow the storage of private information in a secure manner and the execution of modern cryptographic algorithms, it was possible to implement highly secure offline payment systems (Rankl & Effing, 2002). As a result, debit and credit cards are mostly used as a form of microprocessor cards.

Memory Cards

SIM cards used for communication and telephone applications were the first smart cards used commercially. The first SIM card produced was in 1991. These cards are pre-paid, which means the value is stored electronically in the chip. Every time a call is being made, the value is decreased by the amount (Rankl & Effing, 2002). Hence, memory cards can be used for telephone calls and any time a good or service is being sold after pre-payment without using cash.

To sum this up, memory cards have the property to store data. Therefore, they can be considered as miniature USB memory sticks with additional security, whereas, properties of microprocessor cards involve adding, deleting, and manipulating information on the card's memory (Thales, 2021).

4.1.2 Global Smart Card Market Value

Based on the definition of smart cards, its global market value will be derived. According to a report published by Mordor Intelligence in 2021, the Global smart card market was valued at USD 8.51 billion in 2020 (Mordor Intelligence, 2021). Currently, smart cards and card readers own 75% of the market share (Thales, 2021).

Those cards can be clustered into two subcategories with regard to the application area (Figure 3). However, due to complexity, we initially neglected the (2) Mobile Telecommunications/SIM Card market and will exclude it in our project research.

In order to quantify market potential, we considered 1.1 the number of financial cards in circulation, 1.2 the global gift card market size, and 1.3 the number of new students and teaching staff per year using smart cards (Figure 2).

Financial cards in circulation

According to Worldometer, 7.9 billion people are currently living on the planet(Worldometer, 2021). At the same time, there have 34.52 billion cards in existence in 2021 (Euromonitor Portal A, 2021; Trivedi, 2021). This equals four credit or debit cards in circulation for every human (Worldometer, 2021). The number of cards produced last year is equivalent to five billion cards (Euromonitor Portal A, 2021; Trivedi, 2021).

Gift card market size

Considering the global gift card market size, the value amounted to nearly $620 billion in 2019 (Allied Market Research, 2020).

Number of new students and teaching staff

According to a report published in 2020, there are currently 233 million higher education students worldwide (Portal Euromonitor B, 2021). Assuming that every student holds an ID card, this would equal the amount of 233 million cards.

The teaching staff is currently estimated at 12,7 million, which would end up being equal to the amount of 12,7 million cards worldwide (Appendix X: Market potential estimation for each focus group). In total, the higher education institute sector would account for roughly 245 million cards (Appendix X: Market potential estimation for each focus group).

4.1.3 Potential Market Value CEC

Having elaborated on the global market, we narrowed the numbers down to the Iberic area (Portugal & Spain) and the German and French market.

We decided to focus on those areas mainly because of two reasons:

(1) First, our already well-established partnership with SIBS, the largest payment provider/card manufacturer in the Iberic area, benefits us from their existing customer base.

(2) Secondly, due to proximity to the market and knowledge within the country (university network, support etc.), logistics, culture similarities.

The overall market potential will be derived by looking at our three subcategories separately. The detailed calculations can be found in Appendix X: Market potential estimation for each focus group.

Cards in Financial Services

We started our market estimation by looking at the financial cards in circulation, specifically in each country. Then, relying on the numbers provided by the Euromonitor Portal, we came up with the numbers respectively.

France counts 213 million cards in circulation, Germany slightly more with 231 million cards. Portugal holds the smallest amount within the selected countries with 35 million cards, followed by Spain with 110 million (Appendix X: Market potential estimation for each focus group).

To calculate the potential market for SEA!D, we built the sum of all cards in circulation for the selected countries and multiplied it with the customers' willingness to use recycled cards, which is according to the survey we conducted at 95% (Appendix I, J, K: Willingness to switch product). Hence, the elaborated potential market size for financial institutions equals 560 million cards (Appendix X: Market potential estimation for each focus group). Furthermore, we took the number of cards in circulation issued by SIBS into account. According to the financial report published in 2020, SIBS holds 0,9% of all cards in circulation within Western Europe (Orbis, 2020). This accounts for 18,65 million cards (Appendix X: Market potential estimation for each focus group). Furthermore, as SIBS is regarded as the largest payment provider/card manufacturer in the Iberic area, they dominate 51,9% of the Portuguese market (Orbis, 2020). This equals the amount of 18,46 million cards. Within Spain, cards issued by SIBS account for nearly 1 million (Appendix X: Market potential estimation for each focus group).

Due to our already well-established partnership with SIBS and its prominent presence in Portugal and Spain, we rely first on the potential market based on our collaboration with them.

Thus, the potential market within the financial sector for *SEA!D* computed accordingly for the first two quarters of operations equals 18,5 million cards (Appendix X: Market potential estimation for each focus group). Picking up on this, *SEA!D* intends to address the market of Portugal, Spain, Germany, and France in the subsequent period.

Gift Cards

To determine the potential market regarding gift cards used for loyalty and promotions, we referred to the European market share, which yields 25,72% (PR Newswire, 2018). Quantifying the number, Europe reaches the total amount of nearly 160 billion gift cards (Appendix X: Market potential estimation for each focus group).

We used the Gross Domestic Product (GDP) as a distribution metric to break down the numbers for each country. Pro-rata from the country's GDP, we then calculated the respective figures. As Germany accounts for 25% of the European GDP, it also yields the highest number of gift cards, whereas Portugal holds only 2.4 billion cards (Appendix X: Market potential estimation for each focus group).

In total, the four countries together offer the potential for up to 83 billion cards (Appendix X: Market potential estimation for each focus group).

We took the number of cards produced in Europe into account to get a more realistic number. According to the International Card Manufacturers Association, in 2021, 590 million gift and loyalty cards were produced in Europe (Appendix X: Market potential estimation for each focus

group). Therefore, calculating the number produced in Portugal, Spain, Germany, and France leads us to roughly 268 million cards, which we consider the market potential for *SEA!D* (Appendix X: Market potential estimation for each focus group).

ID Cards

In order to quantify the market size within the Higher Education Institution sector, we referred to the data provided by the Eurostat database. In addition, we considered the number of students and the number of teaching staff in each country. We further determined the number of new students each year.

As we plan to address the markets in Portugal, Spain, Germany, and France, 1,462,361 new students per year are our potential customers (Appendix X: Market potential estimation for each focus group). We expect to succeed in convincing 60% of "first-time" students to choose our sustainable alternative (*if the higher education institution offers it to them*.) We also anticipate that some of them already studying will replace their cards with our sustainable solution. In addition to the cards issued to "first intake students", we need to consider an additional amount of cards because students lose or break their cards. Based on interviews with universities, we assume that the number of cards represents 30% of the actual need.

Hence, our market potential within HEI results in 4,853,811 cards (Appendix X: Market potential estimation for each focus group).

4.2 Future Trends

According to Markets and Markets' recent research report, the smart card market value is expected to reach $21.57 billion by 2023 (Markets and Markets, 2021). Demand in recent years has been

driven by the modernisation of governmental services and Covid-19 (contactless) (Business Wire, 2021).

As demand for contactless and digital payments increased during the COVID-19 pandemic, many businesses moved to issue digital cards to their customers first, with the option to add a physical card. David Shipper, Strategic Advisor, states, "Digital cards are a great alternative to disposable physical cards, such as gift cards,(…) however, given a choice, consumers are not yet ready to move exclusively to digital cards and will continue to opt for a physical debit or credit card. We are still many years away from consumers abandoning their physical cards and going 100% digital" (Shipper, 2020).

Also, the study conducted by payment service provider Fiserv shows evidence. 55% of respondents indicated their preference for physical gift cards (Fiserv, 2021). Additionally, the study reveals a strong preference for cards made out of sustainable materials (Fiserv, 2021).

4.3 Expert interviews: Market insights

Due to the pandemic in 2020 and the high level of lobbyism within the transportation/logistics industry, firms exploit the situation by increasing prices around 10-20% of the selling price (Baehler, tide ocean, 2021, Appendix AD19). However, the increase in raw material prices and the delayed transportation times, leading to uncertain planning, come along with it additionally.

Demand is currently skyrocketing due to the COVID situation and the shortage of raw material. Due to labor and transportation shortages, material pricing is double the amount before. Moreover, as Matt Poischberg from Select Plastic states: "Prices do not seem to come down until mid-2022 (Poischberg, Sealect Plastic, 2021, Appendix AD23).

According to industry expert Gonçalo Campos Alves, the demand for recycled material is increasing, especially in the banking card market, since it is tough for them to be sustainable in any other matter (Alves, SIBS, 2021, Appendix AD20).

As Goncalo states, "even though recycled material is more expensive the price difference is not so relevant; of course, it depends on the volume as well, since it still is a niche product, but indeed there is a tendency to migrate" (Alves, SIBS, 2021, Appendix AD20).

Also, Mathias Legner from Volksbank agrees that even though recycled materials tend to be more expensive, banks are willing to bear these extra costs because the reputation and the image idea are worth more (Legner, Volksbank, 2021, Appendix AD24). However, assuming that recycled material is taken as standard, extra costs will be a minimum – depending on the quantities (Legner, Volksbank, 2021, Appendix AD24).

There is also a raising customer awareness in environmentally friendly products. Therefore, the offer of products made out of recycled material will be a competitive advantage, even if the price is higher than the current one for virgin plastic, which is why the credit card changeover to more environmentally friendly material is planned for 2022 (Legner, Volksbank, 2021, Appendix AD24).

4.4 Implications

The previous market overview shows that the smart card market, in general, holds great potential. However, SEA!D will need to develop a value proposition that is attractive enough to gain market share from traditional card manufacturers, and that is compelling enough to be included in existing product portfolios. The expert interviews revealed valuable learnings that can be leveraged to search and execute *SEA!D's* business model

In identifying customers, it is crucial to define the target segment and the unique key characteristics that appear attractive to this segment and are therefore decisive. In addition, the appropriate channels must be evaluated to address and reach this segment. More specifically, strategic partnerships along the supply chain could be used to reach the market and increase the customer base.

Furthermore, changing market conditions due to the ongoing COVID-19 pandemic and its associated results (such as higher prices in raw materials, complications regarding transportation and logistics) can be – despite the resulting challenges – an opportunity to provide not only end customers but also manufacturers with a more convenient and sustainable solution.

5. Field Research – Conceptual Framework

In order to test market response and to gain feedback about the project's viability, a survey was conducted. The goal was to approach potential consumers to gain insights regarding their awareness/consumption behaviour, preferences, and willingness to pay for a product made out of recycled material. Even though our direct customers will first be B2B customers such as financial institutions, higher educational institutions or companies, their purchases will depend on the trends in society and the consumers' willingness to pay for the recycled cards.

5.1. Methods – Survey

5.1.1 Survey Design

Within the survey, primarily close-ended questions were used. The question type refers to any question for which the respondent is provided with a set of alternatives to select an answer. To require a respondence, close-ended questions are often phrased as a statement (Foddy, 1993).

Apart from that, some items got measured using a five-point Linkert Scale, and respondents were given the opportunity to express their personal experiences and opinions through open questions.

The survey duration was predicted to be no longer than two to four minutes to avoid significant bounce rates. The online survey tool Google Form was used to create the survey. The questionnaire was sectioned into 19 questions and divided into general demographic information of the participants, consumption patterns and preferences to determine their choice of card, willingness to switch to a more sustainable alternative, and their maximum amount for the surcharge (Appendix G: Survey Questions).

Questions on general demographic information were intended to ensure that participants could later be divided into groups according to age, gender, and life situation. To determine the card choice, participants were asked general information about the material and appearance of the card and whether they had already been exposed to a more environmentally friendly alternative. The purpose is to find out to what extent the consumer is familiar with the product and at the same time to become aware of our competitors. Those who had not yet had the opportunity to purchase a more sustainable card were inquired about whether they would be interested in the offer and their willingness to switch to such an option. Those who had already been exposed to the sustainable alternative were given a set of questions. Those were asked to explore which manufacturing material was used and whether they had to pay a premium. The last set of questions was designed to measure willingness to pay and the maximum amount. Participants were asked if they would be willing to pay a one-time surcharge and, if so, to choose a range between <5-10< for the price premium. Those who did not indicate a willingness to pay got asked for their lack of motivation and reasons.

5.1.2 Data Collection

A snowball system was used to collect data for the survey, based on the researcher's network throughout Portugal and Germany. The survey was also shared on social networks such as Facebook and Instagram to reach the younger generation and groups connecting people concerned about ocean pollution (GhostNetWork).

5.1.3 Data Analysis

The collected survey data were analysed using Microsoft Excel. Since mainly categorical variables were collected, chi-square analysis and single-factor ANOVA were used to understand the relationships. This descriptive analysis was performed to answer the hypotheses developed.

5.2 Results - Field Research

This section examines the results of the field research. First, a general descriptive analysis provides information about the participants' demographic data. This is followed by a description of the results of the WTP analysis. Building upon this, it will be analysed whether age or general living situation impacts overall willingness to pay and maximum amount. The results section is designed to answer the hypotheses.

5.2.1 Sample Size & Participants

The sample consisted of 209 participants (N=209) who voluntarily completed the short questionnaire for this study. The sample is composed of 42% men and 57% women. Thus, a slightly higher than average proportion of female responses were reported. Most participants were between 18 and 34 years old, accounting for 80% of the cases (Appendix H: Overview of Age Groups & Overview of Living Situation). In addition, 51.4% of the participants were students,

followed by the second largest group of workers, who make up 34.4% (Appendix H: Overview of Age Groups & Overview of Living Situation).

5.2.2 Exposure to Recycled Cards and Willingness to Switch Product

Of the 209 responses, 91% indicated that they were not presented with the option to choose a more sustainable card. Of this proportion, 95% indicated that they would appreciate the offer of a more sustainable alternative, which we attribute as a potential willingness to switch (WTS) to a more sustainable option. Of those who had already been exposed to a more sustainable alternative, 61.1% stated that they had chosen that product.

When analysing the potential willingness to switch, the sample was reduced to a proportion of 191 (N=191), excluding the number of participants who already got in contact with a more sustainable card alternative. Taking demographic factors into account, it becomes clear that the appreciation for a more sustainable offer is very high for both men (92%) and women (97%) (Appendix I: Survey results: Willingness to switch Product: Gender). After performing a contingency analysis, appreciation and potential willingness to switch does not depend on gender; instead, it is high for both (p-value = 0.106 > alpha = 0,05). The same results are obtained when analysing the different age groups. In the largest group of 25-34 years old's, 96% would welcome the opportunity to switch to another, more environmentally conscious card (Appendix J: Survey results: Willingness to switch Product: Age). The results of the chi-square tests again showed no relationship between age and potential willingness to switch (p-value = 0,875 > alpha = 0.05). Thus, socio-demographic factors do not appear to impact willingness to use recycled products. Awareness is sufficiently high to indicate the relevance of and interest in environmentally friendly products, irrespective of demographic factors. That finding implies that we have no reason to reject H1.

The study of the current living situation demonstrates the same trend. In all sample groups, the potential willingness to switch and appreciation for the offer of a recycled product ranges from 94%-100%. Focusing on the largest, more representative groups (e.g., "students and "full-time employees", (N= 165), on average, only 5.5% would not be interested. Considering the results of the contingency analysis performed, it is evident that the potential willingness to switch and the appreciation of recycling offers are independent of the current situation.

This finding concludes that we have no reason to reject H2, so the living situation and the willingness to switch are independent.

5.2.3 WTP and Maximum Amount for the Price Premium

Overall, the survey shows that general awareness of recycled materials is anchored in people's lifestyles. The clear majority of participants are willing to replace their product with one made from environmentally friendly material. Further, 77% of respondents would be willing to pay a premium for this (Appendix K: Survey results: Willingness to switch Product: Current Situation).

To find out whether socio-demographic factors have an influence on the decision to pay an additional amount of money, statistical tests were performed. First, a one-factor ANOVA was designed to test whether the age of the participants influences their willingness to pay. There is a minimal difference in the average age of the two groups (WTP: average age = 31,91; NWTP: average age = 29,00).

Analyzing the findings of the ANOVA, the critical value (3,88677) is larger than F (2,2928) and the p-value larger than alpha (p-value = 0,13 > alpha = 0,05), which leads us to the conclusion that age does not have any significant influence in the willingness to pay (Appendix L: Survey results: ANOVA Age and WTP).

In addition to age, the current situation and the effect on consumers' willingness to pay were examined using a chi-square test. As it can be seen from the previous test, the current situation does not affect the willingness to switch and the appreciation of recycled cards. 73% of the sample (N=209) indicated that they would be willing to pay a one-time fee to obtain a more sustainable alternative. Surprisingly, of the 39% of employees and young professionals, a larger proportion indicated they would not be willing to pay extra for the card compared to the other subgroups (employees: 30% NWTP, young professionals: 50% NWTP) (Appendix M: Survey results: Willingness to Pay: Current Situation). Nevertheless, no significant influence of the variable on the willingness to pay could be identified after the test was conducted (p-value =0,405 > alpha = 0,05). These results mean that hypothesis H3 cannot be rejected, which means that the current situation does not influence whether someone pays for the product.

To evaluate whether our product seems appealing regardless of socio-demographic factors and life circumstances and to get a sense of the maximum price premium our partners and we can charge, we examined the same variables and their impact on the amount.

After reducing the sample size to the proportion of people who had previously indicated they would be willing to pay an additional amount and excluding answers that were not valid to a total of 151 (N=151), respondents had to choose their range in which they would indicate the maximum amount for the price premium. 88% of the participants stated that their acceptance for the price premium is below ten (Appendix N: Survey results: Maximum amount willing to pay: Age). After performing the chi-square analysis, (p-value = 0,7475 > alpha = 0,05), age does not affect willingness to pay in general, nor does it influence the maximum amount willing to pay. The finding verifies H3a.

An analysis of living conditions and their impact on the maximum amount people are willing to pay indicates that students and pensioners are not inclined to pay a higher amount (Appendix O: Survey results: Maximum amount willing to pay: Current situation). One reason for this could be that these groups generally have less disposable income than others. Again, full-time employees show a surprising trend, as one might assume that their payment willingness is higher in terms of income. Examining the extent to which the two variables are dependent on each other, we observe that the current living situation has a minor influence on the amount (p-value= 0.03727 < alpha =0.05). Thus, H3b cannot be validated.

Finally, taking all the findings into account, we conclude that regardless of demographic factors or the life situation people are currently in, there is awareness and acceptance in society (Figure 4).

H1: Rising awareness and acceptance of usage of virgin plastic is engrained in people's consciousness	**Validated-** 95% would appreciate the offer of an environmental friendly alternative;
H2: Consciousness' of the usage of plastic does not depend on living situation and demographic factors	**Validated-** in all subgroups the willigness to switch is between 94-100%;
H3: Socio-demographic differences have no influence on the willingness to pay for recycled products	**Validated-** 77% of participant are willing to pay a premium; no siginficant relationship measurable between the subgroups
H3a: Intergenerational differences do not influence in the maximum amount they are willing to pay for recycled products	**Validated-** 88% of participant are willing to pay a premium of < 10€ : no siginficant relationship measurable between the subgroups
H3b: The current living situation does not influence the maximum amount they are willing to pay for recycled material	**Not validated-** small influence of living situation on monetary amount measurable. Students and Pensioners are less willing to pay a higher amount

Figure 4: Summary of Findings

5.3 Summary and Industry Implications

It is a fact that the demand for environmentally friendly products is constantly increasing. Over the last two years, people have shown interest in the environmental impact of traditional production processes. This process typically involves extracting and distributing raw materials, which are then processed into products purchased and used by consumers and eventually thrown away.

In this context, plastic pollution also seems to have become a trend within society. As a result, more and more Consumers are taking actions towards a more sustainable behaviour, while at the same time demanding more responsibility from companies and governments.

Especially within the banking industry, card issuers know that financial cards such as credit and debit cards are not only used as a means of payment but more importantly, as a physical medium to communicate their corporate identity and core values. However, as our study reveals, the willingness to switch to a card made out of a more sustainable material yields 95%. Also, the survey from CPI Card Group in 2020 shows that 53% would even switch to another financial institution if such a card were offered with the same features and benefits (CPI Card Group, 2020). Hence, card-issuing banks are keen to get the right message across to their more purpose-driven cardholders, and an environmentally friendly payment card seems to be the right product not only to retain existing customers but also to attract new ones and create the long-awaited top-of-the-wallet effect (International Card Manufacturers Association, 2021). Conducting and analysing the survey ourselves has proven that the current situation holds great potential, and we can assume that the market will embrace our product.

At the end of 2020, strategic advisor David Shipper released a report, in which 20 executives from card-issuing companies - primarily headquartered in the U.S. and Canada - were asked to assess the trend on how costumers and business attitudes towards the so called "green card inventory" are changing.

Approximately 80% of card issuers uttered that cardholders nowadays are more environmentally aware than five years ago, which is in line with our findings (Shipper, 2020).

6. Limitations Market and Customer Validation

In terms of market potential, there are some factors to consider regarding completeness. As we are currently only focusing on the specific markets (Portugal, Spain, Germany, and France), this can be seen as a limitation when assessing the full market potential. Furthermore, since we are initially neglecting the market for mobile telephony/SIM cards due to its complexity, the current market overview cannot be considered complete.

The survey we conducted also has certain limitations. The number of respondents was about 200 due to limitations in time and the reliability of the survey; the data may depend on accurate and honest responses, which not all participants may have felt encouraged to give. Although we tried to minimise this effect by conducting an anonymous study, we cannot completely ignore that individuals tend to present their answers somewhat differently, especially regarding social behaviour (Paulhus, 1984). Furthermore, the sample relies mainly on our direct network by distributing the survey in our university, circle of friends and family, mainly from Germany and Portugal. Hence, a more comprehensive study including more responses from different countries and networks would increase the reliability.

7. PART II: Business Model

Note: This work project consists of two individual parts (Part I and Part II). Part II: *Business Model Validation* was compiled by Lisa Marie Geier.

8. Conclusion

This work project aimed to analyse the feasibility of the social business model *SEA!D* towards reaching a problem/ solution fit, complemented by industry and market analysis and customers' acceptance and willingness to pay for recycled materials. The field research, consisting of expert interviews, data analysis, market and customer research, and survey analysis, show that *SEA!D's* business would be feasible on the market if the given material would be suitable for the production of our cards. Time-consuming testing phases of our material and long return rates are the reasons why we do not yet have precise information that our pure material is suitable for this purpose. Nevertheless, we rely on the opinion of experts, who are generally optimistic about the feasibility of the material. The market potential is vast, and the general changes in the sectors are only at the beginning of growth. So, once we have proven that our material meets the requirements, it would be easy to use them in different sectors.

On the consumer side, the acceptance of the product is validated. After testing various hypotheses on differences in socio-demographic factors and current life situations, it was revealed that the appreciation of the option to switch from virgin material to a more environmentally friendly material is equally high and does not differ within the subgroups surveyed. In addition, it was observed that the willingness to pay for a more recycled material of the product is accepted. Differences within the subgroups are not significant and only apply to the maximum amount they are willing to pay. No differences are found in socio-demographic factors, and only the current living situation has a negligible effect on the amount the groups are willing to pay. Thus, students and pensioners are slightly less ready to pay a higher amount than the other subgroups. This result gives us confidence that the price increase resulting from a more comprehensive recycling process and reflected in raw material costs can be absorbed by potential consumers.

In order to further test the different materials, implement the proposed growth strategy, and enter different markets, *SEA!D* will need external capital. This will be used to develop a website for easier distribution and obtain the necessary financial support for further testing to find the perfect blend of materials that maximises both financial requirements and equitable impact.

Overall, our work project not only helped *SEA!D* make progress towards a viable business model. It led to further motivation and desire to achieve the intention set. It also shaped our way of thinking. Hypothesising to test the business model's assumptions, building the first prototypes, understanding customer acceptance, and WTP, virtually selling a product that did not yet exist to financial institutions or pitching to investors and other stakeholders - *SEA!D* was much more than a university work project. It is the first step towards the vision of innovating the card industry and making this project a reality.

9. References

Adane, Legesse and Diriba Muleta. "Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia." *Journal of Toxicology and Environmental Health Sciences* 3 (2011): 234-248. https://doi.org/10.5897/JTEHS.9000067.

Afroz, R., Rahman, A., Masud, M.M., Akhtar, R., 2017. „The knowledge, awareness, attitude and motivational analysis of plastic waste and household perspective in Malaysia" *Environmental Science and Pollution Research* 24 (3), 2304–2315. https://doi.org/ 10.1007/s11356-016-7942-0.

Aftalion, F. 1991. *A History of the International Chemical Industry*. Translated by O.T. Benfey. Philadelphia: University of Pennsylvania Press.

Allied Market Research. 2020. Gift Cards Market by Card Type (Closed-Loop Card and Open-Loop Card) and End User (Retail Establishment and Corporate Institutions): Global Opportunity Analysis and Industry Forecast, 2020–2027 Accessed October 15, 2021 https://www.alliedmarketresearch.com/gift-cards-market.

Astrup, T. F., Pivnenko, K., Eriksen, M. K., & Boldrin, A. 2018. „Life Cycle Assessment of Waste Management: Are We Addressing the Key Challenges Ahead of Us?" *Journal of Industrial Ecology*, 22(5). https://doi.org/10.1111/jiec.12811.

Attenborough, D. Fothergill, Alastair & George Fenton. 2007. Planet Earth: the complete series. [London]: BBC Video.

Ayres, L. 2008. "Semi-Structured Interview," in *The Sage Encyclopedia of Qualitative Research Methods*, edited by Lisa M. Given Thousand Oaks, CA: Sage Publications, 811.

Blue Circular Economy. n.d. Blue Circular Economy – Generates Sustainable Business Opportunities from Waste Fishing Nets, Ropes and Components (FNRC's). Accessed September 2 , 2021, https://bluecirculareconomy.eu/.

Bogner, A. Littig, B. and Menz, W. 2014. *Interviews mit Experten. Eine praxisorientiere Einführung.* Wiesbaden: Springer VS.

Business Wire. 2021.Global Smart Card Market 2021 to 2026. Accessed October 20, 2021, https://www.businesswire.com/news/home/20210406005455/en/.

Business Wire. October 24, 2018. Polyvinyl chloride (PVC) production volume worldwide in 2018 and 2025 (in million metric tons) [Graph]. In Statista. Accessed December 02, 2021, https://www.statista.com/statistics/720296/global-polyvinyl-chloride-market-size-in-tons/.

Bouwman, H., de Vos, H., and Haaker, T. 2008. *Mobile service innovation and business models*. Berlin: Springer.

CPI Card Group. 2020. "Recovered Ocean Plastic Payment Cards" Accessed December 5, 2021, https://www.cpicardgroup.com/ocean-plastic/.

Drucker P F. 1994, The Theory of the Business, *Harvard Business Review*, Vol. 72, No. 5, pp. 95-104.

Epstein, M. J., & Yuthas, K. 2014. *Measuring and Improving Social Impacts: A Guide for Nonprofits, Companies and Impact Investors*. San Francisco: Berrett-Koehler Publishers.

EUPC. 2021. *"Raw Material Shortages in Europe Impact Production of Plastic Products in Europe."* Accessed November 23, 2021, https://press.plasticsconverters.eu/raw-material-shortages-in-europe-impact-production-of-plastic-products-in-europe.

European Commission. 2020. "Social enterprises and their ecosystems in Europe. Comparative synthesis report." Accessed December 8, 2021, https://europa.eu/!Qq64ny.

Euromonitor Portal. 2021 A "Financial Cards and Payments". Accessed December 2, 2021, https://www.euromonitor.com/financial-cards-and-payments.

Euromonitor Portal 2021 B "Higher Education Students (Incl. Universities) in all countries" Accessed December 10, 2021 https://www.portal.euromonitor.com/portal/StatisticsEvolution/index.

Fernqvist, F., Olsson, A., and Spendrup, S. 2015. "What's in It for Me? Food Packaging and Consumer Responses, a Focus Group Study." *British Food Journal*, 117, 1122-1135. https://doi.org/10.1108/BFJ-08-2013-0224.

First Insight 2020. "The state of consumer spending: Gen Z shoppers demand sustainable retail." Accessed November 14, 2021, https://www.businesswire.com/news/home/20200114005180/en/First-Insight-Finds-Expectations-for-Sustainable-Retail-Practices-Growing-with-the-Rise-of-Gen-Z-Shoppers.

Fiserv, 2021. "Consumers Believe a Gift Card's Design is Important When Making a Purchase." Accessed November 14, 2021, https://merchants.fiserv.com/en-us/resources/2021-gift-card-survey/.

Foddy, W. 1993. *Constructing Questions for Interviews and Questionnaires: Theory and Practice in Social Research*. Cambridge: Cambridge University Press.

Gray, S. G., Raimi, K. T., Wilson, R., & Árvai, J. 2019. "Will Millennials save the world? The effect of age and generational differences on environmental concern." *Journal of Environmental Management*, 242, 394–402. https://doi.org/10.1016/j.jenvman.2019.04.071.

Haaker, T., Bouwman, H., Janssen, W., de Reuver, M., 2017. “Business model stress testing: a practical approach to test the robustness of a business model.” *Futures 89*, 14–25.

Hamzaoui-Essoussi, L. H., & Linton, J. D. 2010. “New or recycled products: How much are consumers willing to pay?“ *Journal of Consumer Marketing*, 27(5), 458–468. https://doi.org/10.1108/07363761011063358.

Heale, R. & Forbes, D. 2013. “Understanding triangulation in research.“ *Evidence-based nursing*. https://doi.org/16. 10.1136/eb-2013-101494.

Heidbreder, L. M., Bablok, I., Drews, S., & Menzel, C. 2019. “Tackling the plastic problem: A review on perceptions, behaviors, and interventions.“ *Science of the Total Environment* Vol. 668, pp. 1077–1093. Elsevier B.V. https://doi.org/10.1016/j.scitotenv.2019.02.437.

ICMA - International Card Manufacturers Association, “Eco-Friendly Cards: A Real Trend for the Payments Industry.“ Accessed October 20, 2021, https://icma.com/eco-friendly-cards-a-real-trend-for-the-payments-industry/.

IUCN- International Union for Conservation of Nature. “Marine Plastics.“ Accessed September 2 , 2021, https://www.iucn.org/resources/issues-briefs/marine-plastics#:~:text=At%20least%208%20million%20tons,causes%20severe%20injuries%20and%20deaths.

Katz-Gerroa, T., Greenspanb I., Handyc F.,Veredd, Y. 2020. “ Environmental behavior in three countries: The role of intergenerational transmission and domains of socialisation.“ *Journal of Environmental Psychology,* (71). https://doi.org/10.1016/j.jenvp.2019.101343.

Kelly S. 2010. “Qualitative interviewing techniques and styles.“ In: *The Sage Handbook of Qualitative Methods in Health Research,* edited by Bourgeault I, Dingwall R and de Vries R (eds*)* Thousand Oaks: Sage Publications.

Kielhorn, J., C. Melber, U. Wahnschaffe, A. Aitio, and I. Mangelsdorf. 2000. “Vinyl chloride: still a cause for concern.“ Environmental Health Perspectives 108:579–588. https://doi.org/10.1289/ehp.00108579.

Everard, M., 2008 *PVC: Reaching for Sustainability, The Natural Step and IOM3*. London.

Madigele, P.K., Mogomotsi, G.E.J., Kolobe, M., 2017. “Consumer willingness to pay for plas- tic bags levy and willingness to accept eco-friendly alternatives in Botswana.“ *Chinese Journal of Population Resources and Environment* 15 (3), 255–261. https://doi.org/ 10.1080/10042857.2017.1369243.

Magnier, L., Mugge, R., and Schoormans, J. 2019. Turning ocean garbage into products – Consumers' evaluations of products made of recycled ocean plastic. *Journal of Cleaner Production.* 215. https://doi.org/10.1016/j.jclepro.2018.12.246.

Markets and Markets. 2021. "Smart Card Market" . Accessed November 1, 2021. https://www.marketsandmarkets.com/PressReleases/smart-card-market.asp.

Mason J. 2002. *Qualitative researching*, 2nd ed. London: Sage.

Michaud, C., Llerena D., 2010. Green Consumer Behaviour: an Experimental Analysis of Willingness to Pay for Remanufactured Products *Business Strategy and the Environmen*t, pp. 408-420. https://doi.org/10.1002/bse.703.

Mordor Intelligence. 2021 "Smart Card Market | Growth, Trends, Forecasts (2021 - 2026)." Accessed October 10, 2021, https://www.mordorintelligence.com/industry-reports/smart-card-market.

Newbert S. 2007. "Empirical research on the resource-based view of the firm: An assessment and suggestion for future research." *Strategic Management Journal,* 28: 121-146.

NOAA. 2021. "What is ghost gear?" Accessed December 2, 2021, https://oceanservice.noaa.gov/facts/eutrophication.html.

Orbis. 2020 "SIBS FORWARD PAYMENT SOLUTIONS, S.A." Accessed October 18, 2021. https://orbis.bvdinfo.com/version-20211118/orbis/1/Companies/Report/seq/0.

OSPAR Commission. *"*OSPAR scoping study on best practices for the design and recycling of fishing gear as a means to reduce the quantities of fishing gear found as marine litter in the North-East Atlantic." Accessed September 8, 2021, https://www.ospar.org/documents?v=42718.

Osterwalder, A. 2004. The *business model ontology—A proposition in a design science approach.* Dissertation 173, University of Lausanne, Switzerland.

Osterwalder and Pigneur. 2010. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. Hoboken, NJ: John Wiley & Sons.

Otsyina HR, Nguhiu-Mwangi J, Mogoa EGM, Mbuthia PG, Ogara WO. 2018. "Knowledge, attitude, and practices on usage, disposal, and effect of plastic bags on sheep and goats." *Trop Anim Health Prod.* 50(5):997-1003. https://doi.org/10.1007/s11250-018-1523-9.

Ovans, A. 2015. „What Is a Business Model?" *Harvard Business Review*. Accessed December 8, 2021, https://hbr.org/2015/01/what-is-a-business-model.

Palinkas LA, Horwitz SM, Green CA, et al. 2015. “Purposeful sampling for qualitative data collection and analysis in mixed method implementation research.“ *Administration and Policy in Mental Health and Mental Health Services Research* 42(5): 533–544.

Paulhus, D. L. 1984. “Two-component models of socially desirable responding.“ *Journal of Personality and Social Psychology*, 46(3), 598-609.

Porter, M.E. and Kramer, M.R. (2019). “Creating Shared Value.“ In *Managing Sustainable Business*, edited by Lenssen, G. and Smith, N., 323-346. Dordrecht: Springer.

PR Newswire. July 17, 2018. “Gift card consumption market share worldwide in 2017, by region [Graph].“ In Statista. Accessed December 02, 2021 https://www.statista.com/statistics/1004256/gift-card-consumption-market-share-by-region-worldwide/.

Rankl W. and Effing W. 2002. *Smart Card* Handbook. New York: John Wiley & Sons.

Rethink Plastic Alliance & Break Free from Plastic. 2019. “Curbing Sea-Based Pollution.“ Accessed September 11 , 2021, https://seas-at-risk.org/images/pdf/publications/Sea_Based_Pollution_Rethink_Plastic.pdf.

Richardson, K., Hardesty, D. & Wilcox, C. 2019 “Estimates of fishing gear loss rates at a global scale.“ Accessed September 7 , 2021, http://hdl.handle.net/102.100.100/229636?index=1.

Robinson OC 2014. “Sampling in interview-based qualitative research: A theoretical and practical guide.“ *Qualitative Research in Psychology* 11(1): 25–41.

Santander, 2021. “Santander accelerates the rollout of eco-friendly cards in Europe to support the bank’s green transition.“ Accessed September 11 , 2021, https://www.santander.com/en/press-room/press-releases/2021/03/santander-accelerates-the-rollout-of-eco-friendly-cards-in-europe-to-support-the-banks-green-transition.

Shipper, 2020. “Card companies go green, but hurdles remain.“ Accessed September 2 , 2021, https://www.paymentsdive.com/news/payments-companies-look-towards-greener-future-roadblocks-lie-ahead/602847/.

Statista, 2021. “Price of polyvinyl chloride worldwide from 2017 to 2020 with estimated figures for 2021 to 2022 (in U.S. dollars per metric ton)“ [Graph]. Accessed December 6, 2021, https://www.statista.com/statistics/1171131/price-polyvinyl-chloride-forecast-globally/.

Storm, B. K. 2017. ”Production of recyclates – compared with virgin Plastics – a LCA Study.“ *MATEC Web Conf.* 112 04024. http://doi.org/10.1051/matecconf/201711204024.

Taylor, F. 1957. *A History of Industrial Chemistry*. New York: Abelard Schuman.

Thales, June 2021. “Smart card basics – A short illustrated guide.“ Accessed September 2 , 2021, https://www.thalesgroup.com/en/markets/digital-identity-and-security/technology/smart-cards-basics.

Thales, 2020. “Eco-friendly substitute to plastic credit cards – The bio-sourced alternative.” Accessed September 2 , 2021, https://www.thalesgroup.com/en/markets/digital-identity-and-security/banking-payment/cards/alternative-to-pvc.

Thomas, K., Dorey, C., and Obaidullah, F. 2019. “Ghost Gear: the Abandoned fishing nets haunting our oceans.“ Accessed September 9, 2021, https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/20190611-greenpeace-report-ghost-fishing-ghost-gear-deutsch.pdf.

Thornton, J. 2002. *Impacts of Polyvinyl Chloride Buildings Materials*; Healthy Buiding Network: Washington, DC, USA, 2002.

Trivedi, V. 2021. “Card companies go green, but hurdles remain.“ Accessed September 4 , 2021, https://www.paymentsdive.com/news/payments-companies-look-towards-greener-future-roadblocks-lie-ahead/602847/.

Trost J.A. 1986. “Statistically non-representative stratified sampling: A sampling technique for qualitative studies.“ *Qualitative Sociology* 9(1): 54–57.

UN Environmental Programme. 2018. “Banning single-use plastic: lessons and experiences from countries.“ Accessed October, 23, 2021, https://www.unep.org/interactive/beat-plastic-pollution/.

United Nations. 2021. “The 17 Goals”. Accessed October 5, 2021, https://sdgs.un.org.

Walcher, Dominik and Christoph Ihl. 2019. “Determinants of willingness to pay when purchasing sustainable products: a study from the shoe industry.” *Managing Innovation in a Global and Digital World*: n. pag. https://doi.org/10.1007/978-3-658-27241-8.

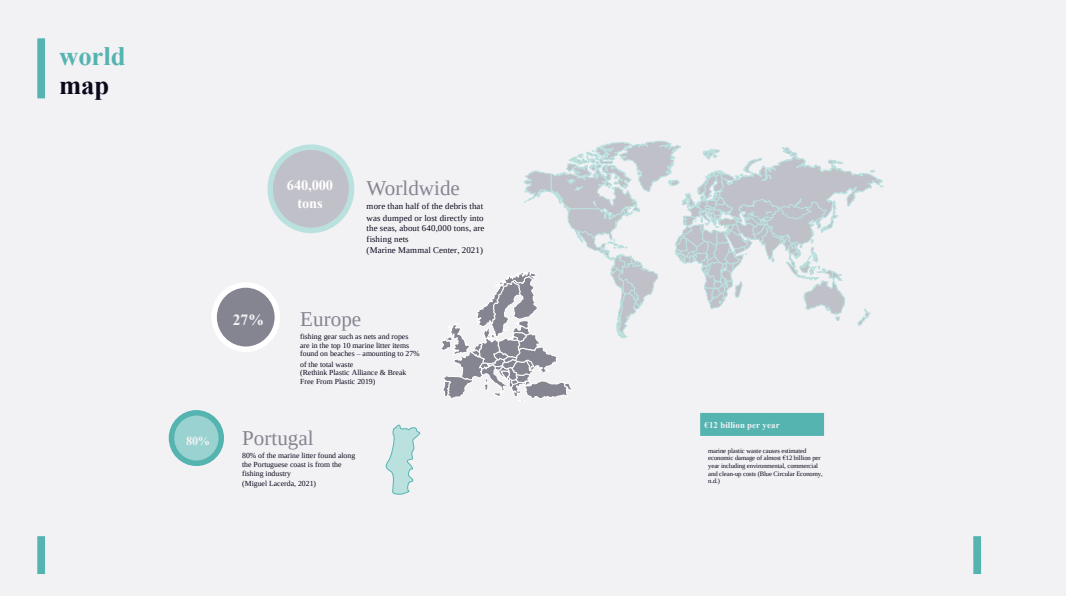
Webster J., and Watson R.T., 2002. “Analysing the past to prepare for the future: Writing a literature review.“ *MIS Quarterly,* 26 (2): 13-23. https://doi.org/10.2307/4132319.

Wiernik, B. M., Ones, D. S., & Dilchert, S. 2013. “Age and environmental sustainability: A meta-analysis.“ *Journal of Managerial Psychology, 28*(7), 826–856. https://doi.org/10.1108/JMP-07-2013-0221.

Worldometer, 2021. “Current World Population” Accessed December 1, 2021. https://www.worldometers.info/world-population/#:~:text=7.9%20Billion%20(2021),currently%20living)%20of%20the%20world.

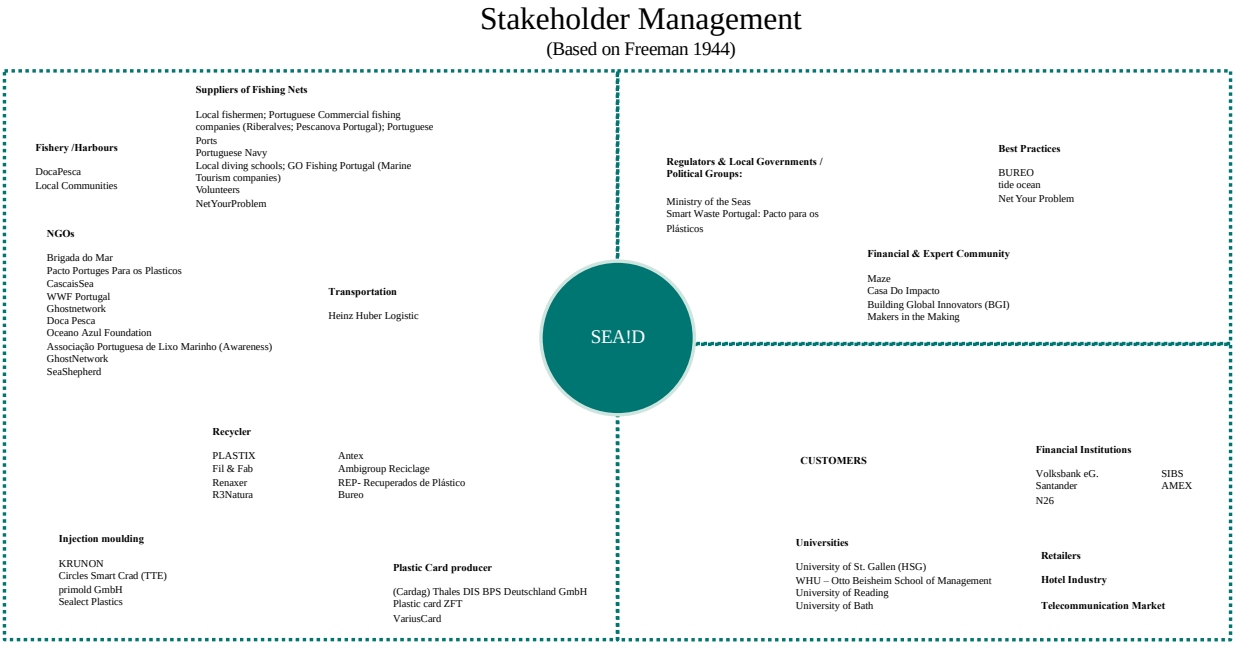
10. Appendix

Appendix A: Numbers & facts ghost nets



Source: Own Representation

Appendix B: Stakeholder Map



Appendix C: Sample with the written text: Email to Interview Partners

Injection Molding/3D Printing

Dear XY Team,

We are Lisa and Carla, master students at NOVA Business School in Lisbon, Portugal and we are currently working on a project that deals with the problem of the so-called "ghost nets". Ghost nets are fishing nets that haunt the sea.

Every year, thousands of marine creatures die as a result.

Our goal is to address this problem by collaborating with NGOs, recycling partners and injection moulding companies/3D printers to create added value. In short, our project Sea!d is about producing plastic cards from ghost fishing nets.

The primary goal is to gather information and better understand the production of plastic cards by injection moulding. In order to initiate the first steps, we would therefore be very pleased to get the chance of scheduling phone call with you.

Thank you in advance and we look forward to hearing from you!

Sunny greetings,

Lisa and Carla

Recycling Companies

Dear XY Team,

We are Lisa and Carla, master students at NOVA Business School in Lisbon, Portugal and we are currently working on a project that deals with the problem of the so-called "ghost nets". Ghost nets are fishing nets that haunt the sea.

Every year, thousands of marine creatures die as a result.

Our goal is to address this problem by collaborating with NGOs, recycling partners and injection moulding companies/3D printers to create added value. In short, our project Sea!d is about producing plastic cards from ghost fishing nets.

The primary goal now is to gather information and gain a better understanding of the recycling process. In order to initiate the first steps, we would therefore be very pleased to get the chance of scheduling phone call with you.

Thank you in advance and we look forward to hearing from you!

Sunny greetings,

Lisa and Carla

Other: NGOs, Best Practice etc.

Dear XY Team,

We are Lisa and Carla, master students at NOVA Business School in Lisbon, Portugal and we are currently working on a project that addresses the problem of ghost nets.

Our aim is to address this problem by collaborating with NGOs, recycling partners, injection moulding companies/3D printers and change makers to create added value. In short, our project Sea!d is about producing plastic cards from old fishing nets.

So, like you, we want to take responsibility and raise awareness about this problem. The first step for us is to get in touch with like-minded people and share best practices.

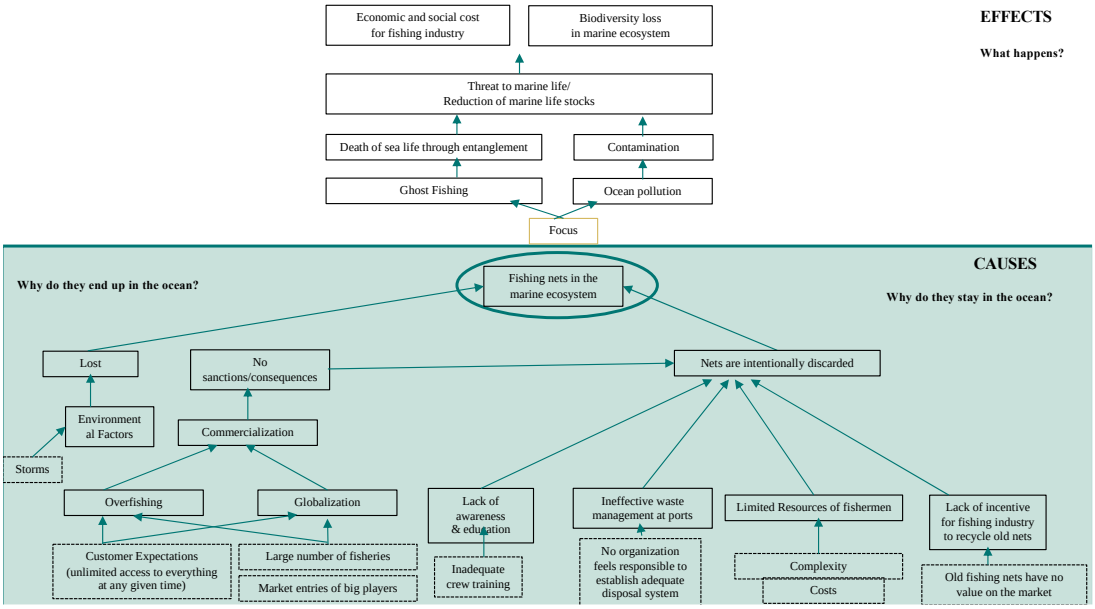
We would therefore be very happy to have the opportunity to exchange ideas.

Thank you in advance and we look forward to hearing from you!

Sunny greetings,

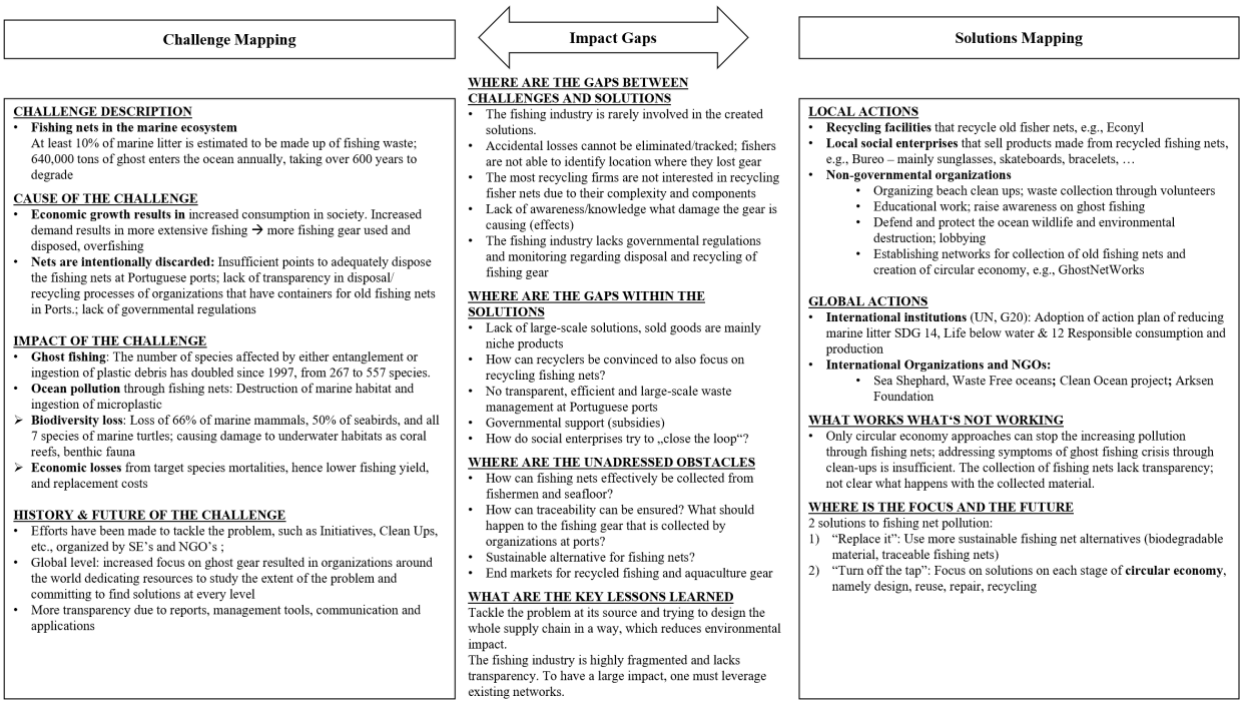
Lisa and Carla

Appendix D: Problem tree: Pollution through Fishing gear



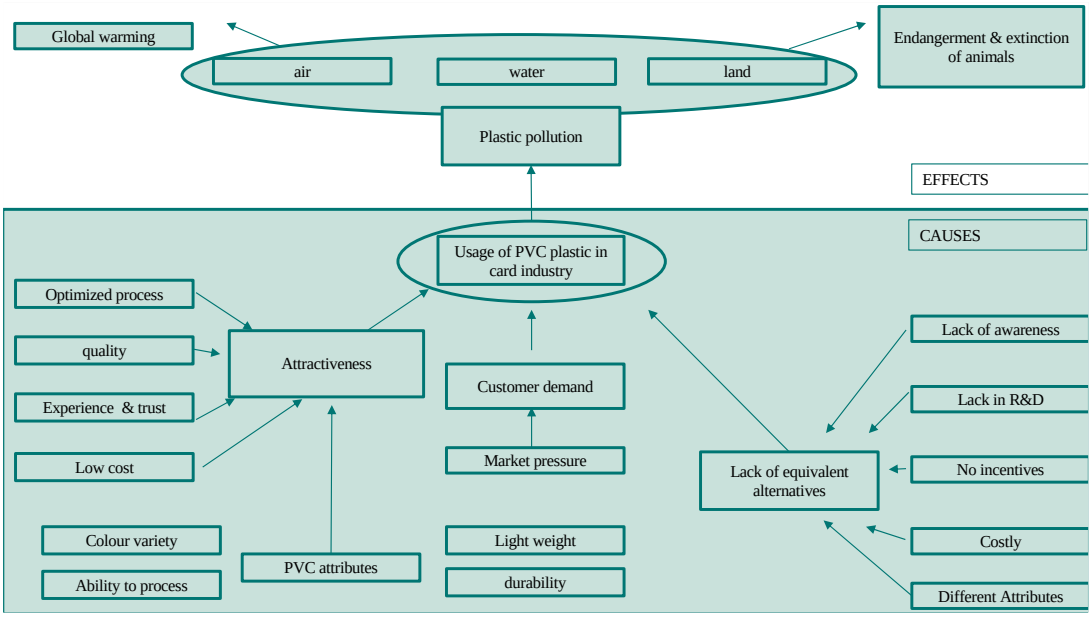
Source: Own representation based on Richardson,K. , Gunn, R., Wilcox,C. & Hardesty,B. (2018). *Understanding causes of gear loss provides a sound basis for fisheries management*. (278–284.) Mar. Pol. 96

Appendix E: Impact Gap canvas

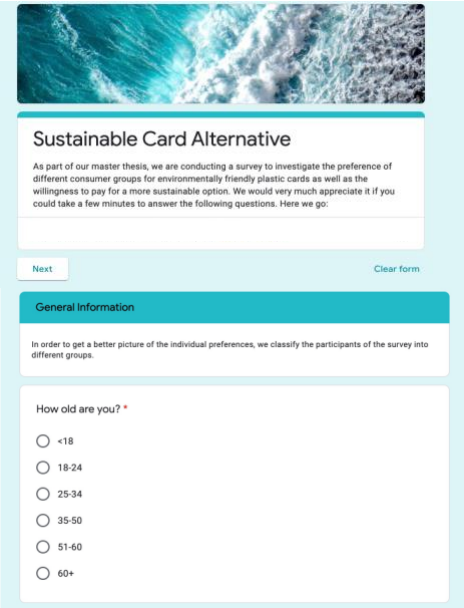


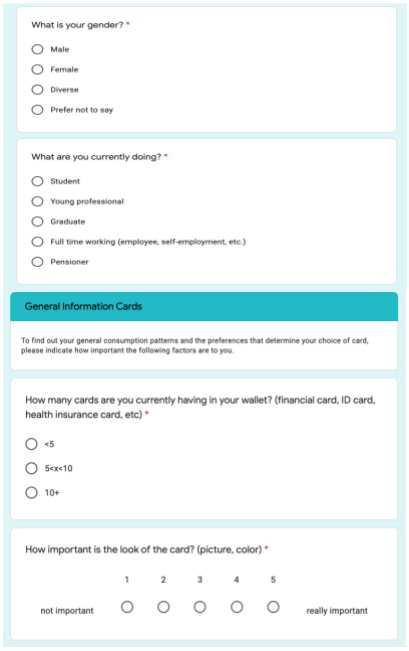
Source: Own representation based on Daniela Papi-Thornton's Impact Gap Canvas (2016)

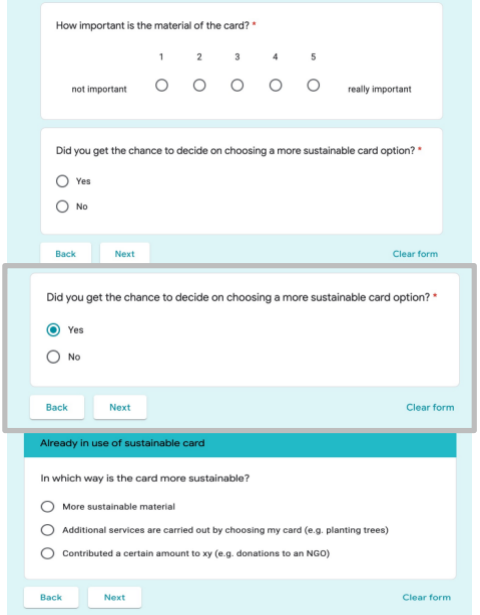
Appendix F: Problem tree: Usage of PVC within the Card Industry

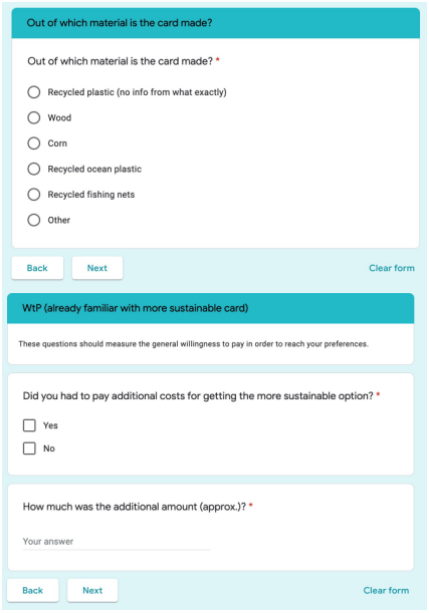


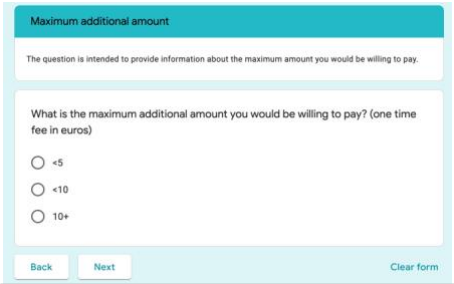
Appendix G: Survey questions

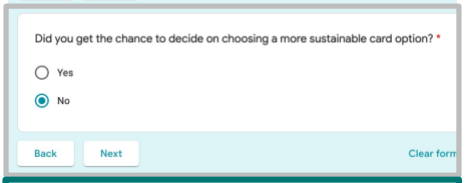


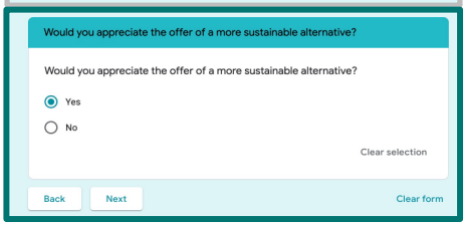


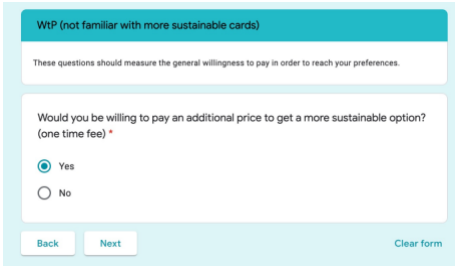


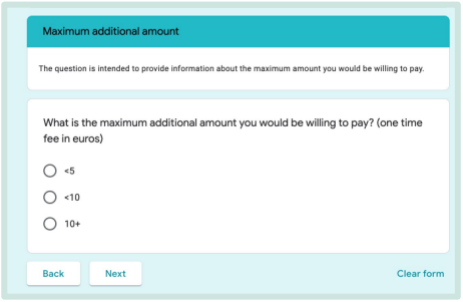


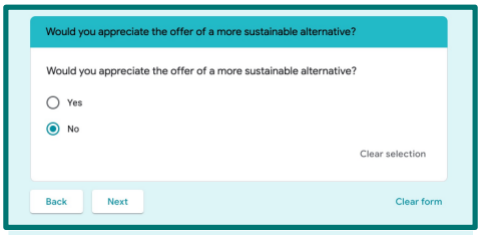

Maximum additional amount
The question is intended to provide information about the maximum amount you would be willing to pay.
What is the maximum additional amount you would be willing to pay? (one time fee in euros)
<5
<10
10+
Back
Next
Clear form

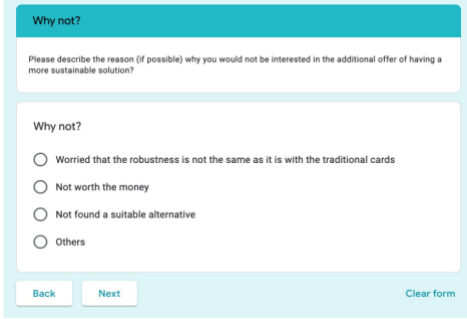

Did you get the chance to decide on choosing a more sustainable card option? *
Yes
No
Back
Next
Clear form

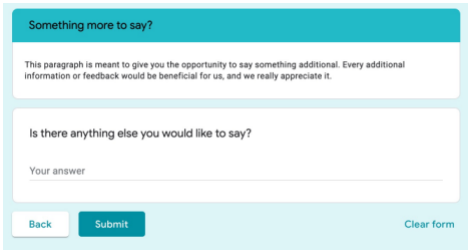

Would you appreciate the offer of a more sustainable alternative?
Would you appreciate the offer of a more sustainable alternative?
Yes
No
Clear selection
Back
Next
Clear form


WtP (not familiar with more sustainable cards)
These questions should measure the general willingness to pay in order to reach your preferences.
Would you be willing to pay an additional price to get a more sustainable option? (one time fee) *
Yes
No
Back
Next
Clear form


Maximum additional amount
The question is intended to provide information about the maximum amount you would be willing to pay.
What is the maximum additional amount you would be willing to pay? (one time fee in euros)
<5
<10
10+
Back
Next
Clear form

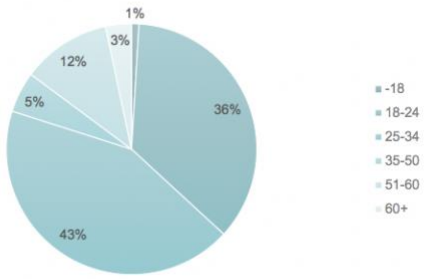

Would you appreciate the offer of a more sustainable alternative?
Would you appreciate the offer of a more sustainable alternative?
Yes
No
Clear selection
Back
Next
Clear form


Why not?
Please describe the reason (if possible) why you would not be interested in the additional offer of having a more sustainable solution?
Why not?
Worried that the robustness is not the same as it is with the traditional cards
Not worth the money
Not found a suitable alternative
Others
Back
Next
Clear form

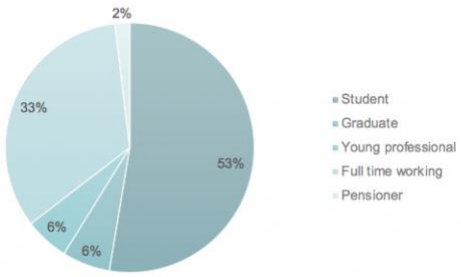

Something more to say?
This paragraph is meant to give you the opportunity to say something additional. Every additional information or feedback would be beneficial for us, and we really appreciate it.
Is there anything else you would like to say?
Your answer
Back
Submit
Clear form

Appendix H: Overview of Age Groups & Living Situation

Overview of age groups



Overview of living situation



Appendix I: Survey results: Willingness to switch Product: Gender

N=191			
Sex		**WTS**	**NWTS**
Male			
	41%	92%	8%
Female			
	59%	97%	3%
Total		95%	5%

Chi square	p-value	Df	Sig-value	Decision
2.608	0.106	1	0.05	Do Not Reject Ho

Appendix J: Survey results: Willingness to switch Product: Age

N=191		
Age	**WTS**	**NWTS**
-18		
1%	100%	0%
18-24		
38%	95%	5%
25-34		
43%	96%	4%
35-50		
4%	88%	13%
51-60		
10%	95%	5%
60+		
3%	100%	0%
Total	95%	5%

Chi square	p-value	Df	Sig-value	Decision
2	0.8751	5	0.05	No Rejection

Appendix K: Survey results: Willingness to switch Product: Current Situation

N=191		
Current Situation	**Yes**	**No**
Student	**Willigness to switch (WTS)**	**Not Willig to switch (NWTS)**
54%	94%	6%
Graduate		
7%	100%	0%
Young professional		
6%	100%	0%
Full time working (employee)		
32%	95%	5%
Pensioner		
1%	100%	0%
Total:	**95%**	**5%**

Appendix L: Survey results: ANOVA Age and WTP

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
YES	153	4882	31,90849673	170,3632826
NO	56	1624,5	29,00892857	94,94082792

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	344,667089	1	344,667089	2,292835712	0,131497657	3,886774365
Within Groups	31116,96449	207	150,3235			
Total	31461,63158	208				

Appendix M: Survey results: Willingness to Pay: Current Situation

N=209			
Current Situation		**WTP**	**NWTP**
Student	53%	76%	24%
Graduate	6%	85%	15%
Young professional	6%	50%	50%
Full time working (employee)	33%	70%	30%
Pensioner	2%	75%	25%
Total	100%	**73%**	**27%**

Chi square	p-value	Df	Sig-value	Decision
5.09	0.405	8	0.05	Do Not Reject Ho

Appendix N: Survey results: Maximum amount willing to pay: Age

N=151		Maximum amount willing to pay		
Age		**<5**	**<10**	**10+**
-18	1%	50%	50%	0%
18-24	35%	45%	45%	9%
25-34	40%	56%	31%	13%
35-50	5%	63%	38%	0%
51-60	14%	38%	43%	19%
60+	4%	67%	33%	0%
Total	100%	50%	38%	11%

Chi square	p-value	Df	Sig-value	Decision
6.79	0.75	10	0.05	Do Not Reject Ho

Appendix O: Survey results: Maximum amount willing to pay: Current situation

N=151		Maximum amount willing to pay		
Current Situation		**<5**	**<10**	**10+**
Student	55%	49%	45%	6%
Graduate	7%	55%	18%	27%
Young professional	4%	33%	17%	50%
Full time working (employee)	32%	52%	35%	13%
Pensioner	2%	67%	33%	0%
Total	100%	50%	38%	11%

Chi square	p-value	Df	Sig-value	Decision
16.38	0.037	8	0.05	Reject Ho

Appendix P: Business Model Canvas

Business Model Canvas

Two major problems confirmed

Lack of sustainable alternatives/solutions in the card industry

Lacking re-usage opportunities for end of life fishing gear

Key Resources • Access to fishing nets • Container for collecting fishing nets at selected Portuguese ports • Foil to laminate cards • Investment for development and testing of material	**Key Activities** **Creating a circular economy for end of life fishing gear by offering card manufacturers an alternative for virgin plastic**	**Type of Intervention** **Tangible product:** Offering an eco-friendly plastic card alternative to virgin plastic made from recycled fishing nets **Intangible product:** Selling an impactful message: Sustainability matters to the university/financial institutions; Awareness raising for ghost fishing among community	**Segments Beneficiaries** • Fishermen and their families • Local communities • Local tourism industry • Marine ecosystem (ocean)	**Value Proposition** **Beneficiary Value Proposition** • **Direct positive effects:** Increased # of collection points for them to adequately dispose fishing nets; Access to more sustainable fishing nets (through Sea!D surplus) • **Indirect positive effect:** Reduced fishing net pollution results in higher fish population → higher fishing yield
				Impact Measurement **SDG 14: Life below water** • # kg of fishing nets collected • # of sustainable fishing nets given to local fishermen • # floating plastic debris density removed from impact area **Project scope** • # fishermen involved/ benefited from the project • # of Portuguese ports covered by the project • # recycled cards sold
Partners + Key Stakeholders • Recycling Companies • Card Manufacturers • NGO's • Financial Institutions • Higher Educational Institutions • (for more details see Stakeholder map)		**Channels** • Announcements on partners social media channel/ website about Sea!D • Customer universities – WOM, universities promotion of purchasing Sea!D through social media channels/ website (purpose of demonstrating sustainability efforts) • Sea!D social media channels on Instagram, LinkedIn, YouTube and own website	**Customers** European public and private universities that want to promote sustainable transformation Financial institutions	**Customer Value Proposition** Offering a sustainable plastic card alternative
Cost Structure • **Outsourced production cost:** Recycling of raw materials, Manufacturing of cards • Logistics Costs (Transportation & Shipping) • **Marketing & Promotion expenses:** Digital advertising, Website setup & Maintenance		**Surplus** **Reinvest profits:** Funding of Education Programmes, more sustainable equipment for fishermen (e.g., more sustainable fishing nets from indigo)	**Revenue** Sale of eco-friendly/ recycled plastic cards to universities, financial institutions, hotels etc.	

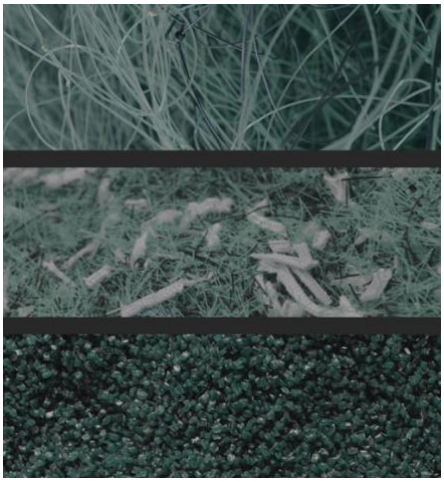
Source: Own representation based on *Tandemic* Social Business Model Canvas

Appendix Q: Value chain of SEA!D

Support activities	Firm infrastructure						
	Human resource management						
	Technology development						
	Procurement						
Primary activities	Collecting the fishing nets in collaboration with partners (create collection process)	Distribution of fishing nets	Cleaning & Recycling the fishing nets into recycled plastic	Creating the *SEA!D* card (pressing the card from recycled nylon, insert the microchip)	Customization of the product: Add layer to the card (if requested) and print the card according to customer order	Distribution of *SEA!D* cards	Marketing & Sales of *SEA!D* cards
	OUTSOURCED			**IN PARTNERSHIP WITH SIBS**		**INTERNALIZED**	

Source: Own representation based on Michael Porter's Value Chain Mapping (1985).

Appendix R: Image of recycled fishing nets

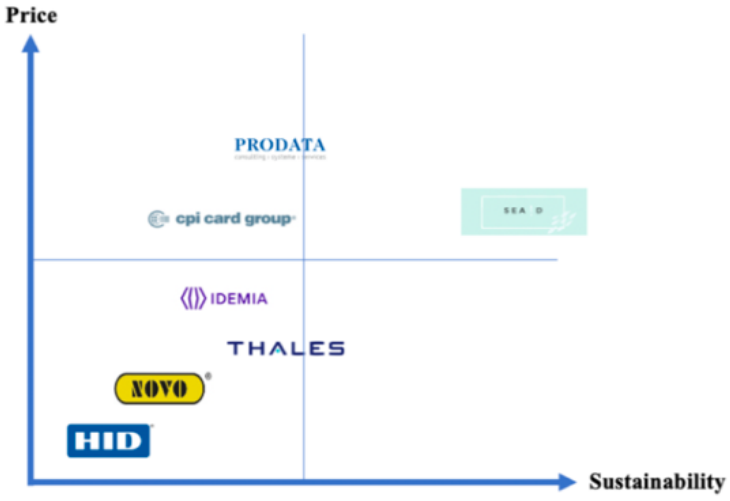


Source: https://www.fil-et-fab.fr

Appendix S: Illustration of Card layering

Source: https://www.cardlogix.com/services/card-manufacturing/attachment/card-layers-3/

Appendix T: Positioning map



Appendix U: Example Impact Report

OUR STORY SO FAR

OUR MISSION

SEA!D pursues the mission to reduce ghost fishing on the Portuguese coast and net waste in the harbours through the recycling of fishing nets to ultimately contribute to the protection of the marine ecosystem. Its core product is a redefined, eco-friendly card made from recycled fishing nets. However, it not only sells a tangible product but an impactful message: it signals the customer's commitment to sustainability and raises awareness on the pressing issue of ghost fishing among society.

OUR PURPOSE

Saving the oceans by tackling the problem of ghost nets and hence providing financial institution and end customers with the opportunity to eco-friendly products.

25000

KG OF NETS
COLLECTED
RECYCLED
AND UPCYCLED

OUR 2022 GOALS

1

1 MILLION CARDS PRODUCED

Our primary goal for 2022 will be to produce at least 1 million upcycled cards, which would result in 7 tons of virgin plastic saved.

2

100 FISHERMENS EQUIPPED WITH NFC TECHNOLOGY

In order to reduce the amount of ghost nets, we will provide NFC technologyy to our fishermen community.

3

25 EDUCATION WORKSHOPS HOSTED

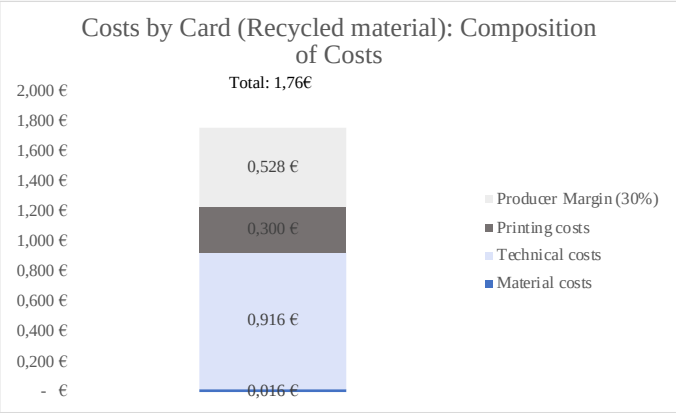
SEA!D wants to help "closing the tap" by lowering the consumption of unsustainable fishing nets. This will lower ocean pollution and related impacts. Through the activities and reinvestment of the surplus, SEA!D creates value for the Portuguese fishermen, project partners and local communities (beneficiaries).

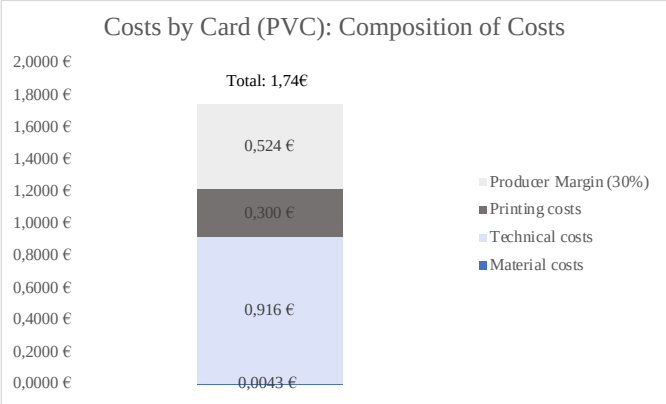
4

B-CORP CERTIFICATION

By the end of 2022 our goal is to be B Corp certified.

Appendix V: Costs per Card: Composition of Costs





Appendix W: Underlying assumptions of financial projections

ASSUMPTIONS

COSTS		
Material costs		Based on our prototyping experience, our financial projections are calculated using Plastix's material, as rHDPE and rPPC appear to be more suitable than nylon - 6. A more accurate calculation can be made once we receive feedback from our manufacturer, who is currently testing all three materials.
Virgin plastic	0,57 €	per kg according to Poischberg, Sealect plastic
Option 1		
Raw Material (Plastic Pellets) < 120 tonnes per year	1,60 €	per kg supplier: PLASTIX
Cost per g	0,00160 €	Plastix
Material needed to produce a card (5g card + 5 g buffer)	10	US Credit Card guide
Material Costs for 1 Card (5g) + Buffer (5g)	0,01600 €	
Option 2:		
Raw Material (Plastic Pellets) < 120 tonnes per year	7,50 €	Per kg Fil & Fab (Nylon -6)
Cost per g	0,0075 €	
Material needed to produce a card (5g card + 5 g buffer)	10	US Credit Card guide
Material Costs for 1 Card (5g) + Buffer (5g)	0,075	
Printing costs	20-40ct per card	University of Reading/Bath (Interview)
Technical costs		Working with somewone who can provice us with all in one solution) EMV, contactless, magnetic strips, RFID antennas and barcodes
Plastic card unit Costs Recycling and Printing included	1,76 €	Price calculation referred to various interviews conducted with producers consisting of raw material, technical costs, printing and margins for our producer.Operating marging references - due to more complexe manufacturing and higher material price slightly lower than reference companies.
Additional Costs (Administrative Costs)	1.000,00 €	Costs for Insurance and Adminsitration based on interview tide ocean, Beat Baehler
CAPEX		
Upfront development website	20.000	Assumption: ecommerce functionality leads us to a more complex building process and due to marekt research we assume 20.000 in total
Research and Development costs (testing - chemical composition mixture)	150,00 €	per hour (consultancy service) based on interview Net Your Problem, Nicole Baker
Number of Warehouse products (Inventories)	20%	additionals 1/5 (20%) amount of Cards from earlier years in order to ensure operations
Fixed Costs		
Transportation Costs		
LKW (23 tonnes)	0,869	euro per km for a full transporter based on interview Heinz Huber spedition, Sebastian Huber
Personell costs (per person, per months)	2100	
Number of empolyees (start)	3	Sea!D starts with the founding team as employees and than increase the amonut of people as soon as there are more partners or we want to extend in different sectors. In the first months of our operations we as the founding team will only get 75% of the monetary compensation in order to get the operations rolling
Numbers of employees increase per year	5%	
Number of employees doing remote Work	25%	Assumtion: at least 25% doing remote work, we do not need an office with place for everyone
Number of employees working from the office	75%	
Rent and Utility costs (Assumtion: (Personell * Sqm per personell * € per sqm))	(# x 20qm x 15€) Rent 0,1 x rent (utility costs)	Ports
Production hall (per month)	3.000,00 €	Based on reference objects on idealista
Marketing costs		
offline marketing (flyer and poster, newsletter)	1200	
Social media	1200	
Website		
Website costs (Maintanance) (per month)	40	
CRM (per month)	20	
Tax rate	21%	
Discount rate for Start ups (15%-21%)	17,50%	

ASSUMPTIONS

Demand Projection		
Market Coverage (first Quarter)		Assumption: Our market coverage will be larger within the CEC: Financial Institutions focus group due to our focus on the developed partnership with SIBS
CEC: Financial Institutions	0,75	
CEC: Gift cards	0,5	
HEI	0,5	
Expected growth rate (linear growth) of market		
CEC: Financial Institutions	0,81%	Euromonitor, Forecast Financial cards in circulation (PT, ES, GER, FR). Average growth rate
CEC: Gift cards	14,56%	Based on information: data bridge marekt research
HEI	1,5%	europa.eu "European Semester thematic factsheet tertiary education attainment"
Expected Quarterly Growth Rate of Market Coverage (all Segments))	15%	Assumption: We assume that we are bale to generate a quartely Growth Rate of Marekt Coverage (all Segments)
Average Selling Price per card	2,00	Calculated based on unit costs, reference margins and interview, Nieves, SIBS
Operating Margin	10,54%	Calculated based on unit costs, reference margins and interview, Nieves, SIBS
Average Churn rate	25,00%	Statista, "customer-churn-rate-by-industry-us"
Number of cards reflected in customer churn per customer	8	Based on survey: avarage amount of cards in wallets

Appendix X: Market potential estimation for each focus group

Focus Groups:

Estimated size of focus group 1: CEC: Financial Services market

Financial cards in Circulation (2020)			Source/ assumption
World (2021)	34.518.682.600		https://www.portal.euromonitor.com/portal/StatisticsEvolution/index#
Western Europe (2021)	2.072.971.000		
France	213.184.000		https://www.portal.euromonitor.com/portal/statisticsevolution/index
Germany	231.429.800		
Portugal	35.575.200		
Spain	110.130.100		
SIBS (2020)			
SIBS amount of cards in circulation WESTERN EUROPE	0,90%		https://www.portal.euromonitor.com/portal/StatisticsEvolution/index#
Amount of Cards SIBS	18.656.739		
SIBS amount of cards in circulation PORTUGAL	51,90%		
Amount of Cards SIBS	18.463.529		
SIBS amount of cards in circulation SPAIN	0,90%		
Amount of Cards SIBS	991.171		
Potential Market for CEC (Amount of Cards)	**590.319.100**		
Potential Market for Sea ID			
Customer willing to use recycled cards	95%		Survey Results SEA ID
Potential Market for Sea ID (Amount of cards)	**560.803.145**		
Potential Market for SEA ID only SIBS	**18.481.965**		

CEC: GIFT CARDS

Global Market Value	619.250.000.000		https://www.alliedmarketresearch.com/gift-cards-market
Europe	159.271.100.000		
Market Share Europe	25,72%		https://www-statista-com.eu1.proxy.openathens.net/statistics/1004256/gift-card-consumption-market-share-by-region-worldwide/
number of cards produced in Europe (2019)	515.000.000	309,26	https://icma.com/2019-european-card-industry-statistics-and-market-trends/
Portugal	2.423.574.335	0,015216661	https://de.statista.com/statistik/daten/studie/188776/umfrage/bruttoinlandsprodukt-bip-in-den-eu-laendern/#professional
Spain	13.426.795.728	0,084301519	pro rata GDP
France	27.279.126.438	0,171274804	
Germany	39.886.931.916	0,250434209	
Total	83.016.428.416	0,521227193	
Growth Rate x-2027	14,56%		https://www.databridgemarketresearch.com/news/global-gift-card-market
Number of cards produced in Europe (2021)	589.984.000		
Number of cards produced in PT, ES, GER, FR	268.432.005		
Number of cards produces in Europe (2021)	337.472.716		
Market coverage SealD (year 1)	0,02		
Potential market Sea ID (Amount of Cards)	**5.368.640**		

Estimated size of focus group 3: Institutions (HEI, ...)			
			Source / assumption
HEI students WORLD	233.076.800		https://www.portal.euromonitor.com/portal/statisticsevolution/index
HEI teaching staff	12.702.900		https://www.portal.euromonitor.com/portal/statisticsevolution/index
HEI **Portugal**			
Students in Portugal	356.400		explained/index.php?title=File:Number_of_tertiary_education_students_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
Teaching Staff in Portugal	34.200		explained/index.php?title=File:Teaching_staff_in_tertiary_education_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
number of new students in Portugal (new cards also teaching stuff included)	140.000	39%	DGEEC (2019)
HEI **Spain**			
Students in Spain	1.051.800		explained/index.php?title=File:Number_of_tertiary_education_students_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
Teaching Staff in Spain	171.900		
number of new students in Spain	413.165	36%	
HEI **France**			
Students in France	2.618.700		explained/index.php?title=File:Number_of_tertiary_education_students_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
Teaching Staff in France	115.600		
number of new students in France (new cards also teaching stuff included)	418.992	16%	
HEI **Germany**			explained/index.php?title=File:Number_of_tertiary_education_students_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
Students in Germany	3.127.900		
Teaching Staff in Germany	416.200		
number of new students in Germany (new cards also teaching stuff included)	490.204	16%	https://www-statista-com.eu1.proxy.openathens.net/statistics/584089/first-year-student-numbers-germany/
HEI **EUROPE**			
Students in Europe	17.502.000		explained/index.php?title=File:Number_of_tertiary_education_students_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
Teaching Staff in Europe	1.351.500		https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Teaching_staff_in_tertiary_education_by_sex_and_level_of_education,_2018_(thousands)_ET2020.png
number of new students in Europe	6.875.084		
Students SUM (PT, GER, ES, FR)	7.154.800		
Staff SUM (PT, GER, ES, FR)	737.900		
Number of new students (PT,GER, ES, FR)	1.462.361		
Amount of new Student cards needed (start)	60%		Assumption, Based on survey (choose of sustainable alternative)
Replacement of old Cards per year	25%		
additional cards needed (broken/lost)	30%		University of Reading Interview)
Potential Market for HEI	**4.852.811**		

Demand per Segment

	Segments		
	CEC: Financial Institutions	**CEC: Gift cards**	**HEI**
Potential Market (Amount of cards)	560.803.145	268.432.005	4.852.811
Potential Market SIBS (Y1Q1)	18.481.965		
Potential Market SIBS (Y1Q1)	12.937.375	5.544.589	
Market Coverage (first Quarter)	0,75%	0,5%	0,5%
Market coverage exponetial growth			
Expected growth rate (linear growth) of market	0,81%	14,56%	1,5%

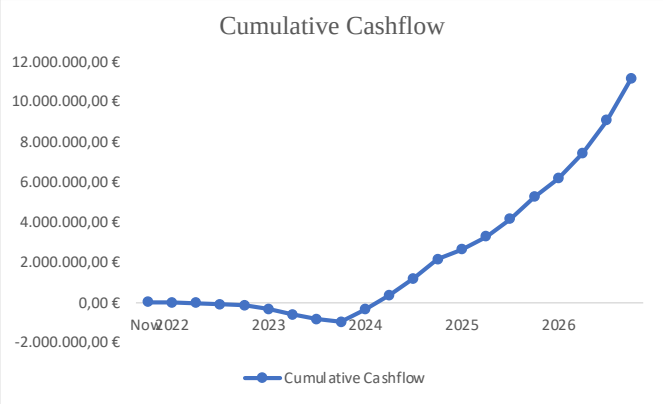
Appendix Y: Profit & Loss Statement

Profit and Loss

Profit & Loss	Now	2022				2023				2024				2025				2026			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
		1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5
Total Sales Revenue Sea ID		46.782,47 €	53.799,84 €	2.760.651,33 €	3.174.749,03 €	3.801.654,53 €	4.371.902,71 €	5.027.688,12 €	5.781.841,33 €	6.945.320,88 €	7.987.119,02 €	9.185.186,87 €	10.562.964,90 €	12.739.862,52 €	14.643.972,19 €	16.837.312,59 €	19.362.909,48 €	23.401.266,31 €	26.904.586,56 €	30.974.029,21 €	35.620.133,59 €
Costs of revenue (COGS)		41.168,58 €	47.343,86 €	2.429.373,17 €	2.793.779,15 €	3.345.455,99 €	3.847.274,39 €	4.424.365,54 €	5.088.020,37 €	6.111.882,38 €	7.028.664,73 €	8.082.964,44 €	9.295.409,11 €	11.211.079,01 €	12.886.695,53 €	14.816.835,08 €	17.039.360,34 €	20.593.114,35 €	23.676.036,17 €	27.257.145,70 €	31.345.717,56 €
Gross Margin		5.613,90 €	6.455,98 €	331.278,16 €	380.969,88 €	456.198,54 €	524.628,33 €	603.322,57 €	693.820,96 €	833.438,51 €	958.454,28 €	1.102.222,42 €	1.267.555,79 €	1.528.783,50 €	1.757.276,66 €	2.020.477,51 €	2.323.549,14 €	2.808.151,96 €	3.228.550,39 €	3.716.883,51 €	4.274.416,03 €
Transportation Costs		3.097,99 €	3.097,99 €	3.097,99 €	3.097,99 €	3.097,99 €	3.097,99 €	6.195,97 €	6.195,97 €	6.195,97 €	6.195,97 €	9.293,96 €	9.293,96 €	9.293,96 €	12.391,94 €	12.391,94 €	15.489,93 €	18.587,91 €	18.587,91 €	21.685,90 €	24.783,88 €
Marketing costs		2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €	2.400,00 €
Personell costs		18.900,00 €	18.900,00 €	18.900,00 €	18.900,00 €	33.600,00 €	33.600,00 €	33.600,00 €	33.600,00 €	42.000,00 €	42.000,00 €	42.000,00 €	42.000,00 €	50.400,00 €	50.400,00 €	50.400,00 €	50.400,00 €	58.800,00 €	58.800,00 €	58.800,00 €	58.800,00 €
Rent (incl. Utility Costs)		2.700,00 €	2.700,00 €	2.700,00 €	2.700,00 €	3.600,00 €	3.600,00 €	3.600,00 €	3.600,00 €	4.500,00 €	4.500,00 €	4.500,00 €	4.500,00 €	5.400,00 €	5.400,00 €	5.400,00 €	5.400,00 €	6.300,00 €	6.300,00 €	6.300,00 €	6.300,00 €
Rent (Storage)		12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €	12.000,00 €
Website		240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €	240,00 €
Total other costs (Administrative etc.)		1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €	1.000,00 €
Operating Expenses		40.337,99 €	40.337,99 €	40.337,99 €	40.337,99 €	55.937,99 €	55.937,99 €	59.035,97 €	59.035,97 €	68.335,97 €	68.335,97 €	71.433,96 €	71.433,96 €	80.733,96 €	83.831,94 €	83.831,94 €	86.929,93 €	99.327,91 €	99.327,91 €	102.425,90 €	105.523,88 €
Operating Expenses per card		1,72 €	1,50 €	0,03 €	0,03 €	0,03 €	0,03 €	0,02 €	0,02 €	0,02 €	0,02 €	0,02 €	0,01 €	0,01 €	0,01 €	0,01 €	0,01 €	0,01 €	0,01 €	0,01 €	0,01 €
EBITDA (= EBIT)		-34.724,09 €	-33.882,00 €	290.940,17 €	340.631,90 €	400.260,56 €	468.690,34 €	544.286,60 €	634.784,99 €	765.102,54 €	890.118,31 €	1.030.788,47 €	1.196.121,83 €	1.448.049,55 €	1.673.444,72 €	1.936.645,57 €	2.236.619,21 €	2.708.824,05 €	3.129.222,48 €	3.614.457,61 €	4.168.892,15 €
Operating Margin				10,54%	10,73%	10,53%	10,72%	10,83%	10,98%	11,02%	11,14%	11,22%	11,32%	11,37%	11,43%	11,50%	11,55%	11,58%	11,63%	11,67%	11,70%
Tax rate	0,21																				
Taxes (tax rate =21%)		-7.292,06 €	-7.115,22 €	61.097,44 €	71.532,70 €	84.054,72 €	98.424,97 €	114.300,19 €	133.304,85 €	160.671,53 €	186.924,85 €	216.465,58 €	251.185,58 €	304.090,40 €	351.423,39 €	406.695,57 €	469.690,03 €	568.853,05 €	657.136,72 €	759.036,10 €	875.467,35 €
Net Income (Profit)		-27.432,03 €	-26.766,78 €	229.842,74 €	269.099,20 €	316.205,84 €	370.265,37 €	429.986,42 €	501.480,14 €	604.431,00 €	703.193,47 €	814.322,89 €	944.936,25 €	1.143.959,14 €	1.322.021,33 €	1.529.950,00 €	1.766.929,18 €	2.139.971,00 €	2.472.085,76 €	2.855.421,51 €	3.293.424,80 €
Cashflow Statement																					
Operational Cashflow		-27.432,03 €	-26.766,78 €	229.842,74 €	269.099,20 €	316.205,84 €	370.265,37 €	429.986,42 €	501.480,14 €	604.431,00 €	703.193,47 €	814.322,89 €	944.936,25 €	1.143.959,14 €	1.322.021,33 €	1.529.950,00 €	1.766.929,18 €	2.139.971,00 €	2.472.085,76 €	2.855.421,51 €	3.293.424,80 €
Investment Cashflow	22.250,00 €			-301.799,13 €	-301.799,13 €	-647.355,20 €	-647.355,20 €	-647.355,20 €	-647.355,20 €	13.379,52 €	13.379,52 €	13.379,52 €	13.379,52 €	-660.298,01 €	-660.298,01 €	-660.298,01 €	-660.298,01 €	-1.220.624,69 €	-1.220.624,69 €	-1.220.624,69 €	-1.220.624,69 €
Free Cashflow	22.250,00 €	-27.432,03 €	-26.766,78 €	-71.956,40 €	-32.699,93 €	-331.149,36 €	-277.089,83 €	-217.368,78 €	-145.875,06 €	617.810,52 €	716.572,99 €	827.702,41 €	958.315,77 €	483.661,14 €	661.723,32 €	869.651,99 €	1.106.631,17 €	919.346,31 €	1.251.461,07 €	1.634.796,82 €	2.072.800,11 €
Cumulative Cashflow	22.250,00 €	-5.182,03 €	-31.948,81 €	-103.905,21 €	-136.605,14 €	-336.331,39 €	-613.421,22 €	-830.790,00 €	-976.665,06 €	-358.854,54 €	357.718,44 €	1.185.420,85 €	2.143.736,62 €	2.627.397,76 €	3.289.121,08 €	4.158.773,07 €	5.265.404,25 €	6.184.750,56 €	7.436.211,62 €	9.071.008,45 €	11.143.808,56 €
Discounted FCF (17,5% DR)	22.250,00 €	-23.346,41 €	-22.780,24 €	-61.239,49 €	-27.829,73 €	-239.854,67 €	-200.698,84 €	-157.442,31 €	-105.658,71 €	380.839,25 €	441.719,76 €	510.223,69 €	590.738,17 €	253.740,46 €	347.156,24 €	456.240,71 €	580.565,78 €	410.477,92 €	558.763,48 €	729.918,64 €	925.482,24 €
NPV	5.369.265,94 €																				

Cash Burn Rate		-27.432,03 €	-26.766,78 €	-71.956,40 €	-32.699,93 €	-199.726,25 €	-277.089,83 €	-217.368,78 €	-145.875,06 €	617.810,52 €	716.572,99 €	827.702,41 €	958.315,77 €	483.661,14 €	661.723,32 €	869.651,99 €	1.106.631,17 €	919.346,31 €	1.251.461,07 €	1.634.796,82 €	2.072.800,11 €

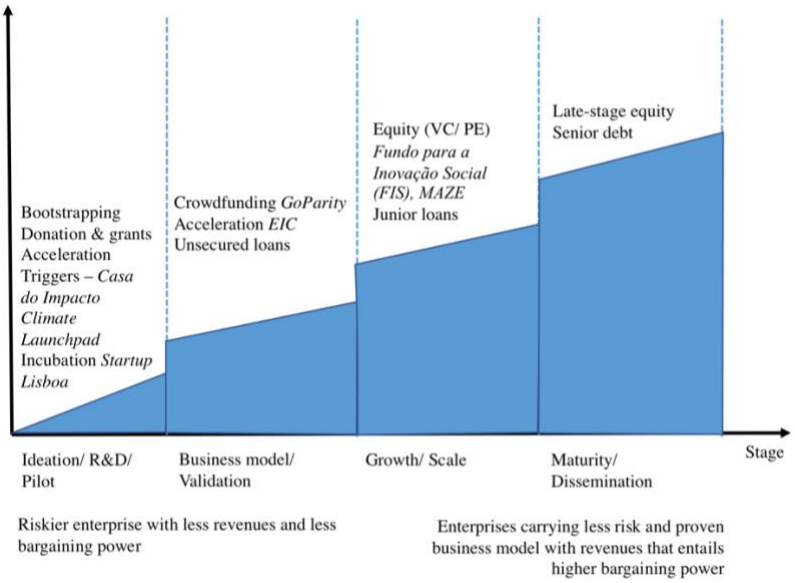
Appendix Z: Illustration Cumulative Cashflow



Appendix AA: Scenario Analysis

Scenario 1 - Expected Values		
Market coverage		1.25%
Expected quarterly growth rate		15,00%
NPV	5.369.265,54 €	
Scenario 2 - Worst Case		
Market coverage		0,07%
Expected quarterly growth rate		5,00%
NPV	-443.143,48 €	
Scenario 3- Best Case		
Market coverage		3,00%
Expected quarterly growth rate		20,00%
NPV	11.284.010,20 €	

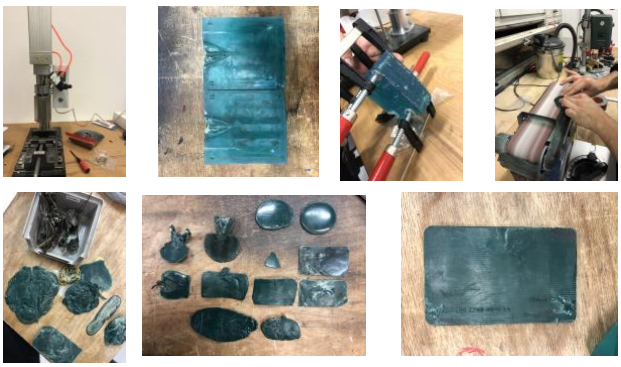
Appendix AB: Adequate form of financing for SEA!D in different stages of lifecycle



Appendix AC: Product Description & Prototyping Process

Product specifications:

- **Raw material:** The recycled rPA-6/rHDPE/rPPC from fishing nets is the only raw material used for creating the card (please see picture above).
- **Technology:** Once the card is pressed, a microchip or NFC chip is added to the card, including all the technology required by the customers.
- **Customization:**
  - **Design:** This will give the customers every freedom to design the card as they need it
  - **Print:** The card is then ultimately printed with the customers desired design (e.g., university logo, ...)



Appendix AD: Interview partner overview

Company name / NGO	Interviewee	Position	Region	Sector	Appendix Nr
Plastic Card producer					
(Cardag) Thales DIS BPS Deutschland GmbH	Steffi Lasch	Sales	Germany	Card producer	**AD14**
Plastic card ZFT	Réne Blankenhagel	Managing director	Germany	Card producer	**AD7**
VariusCard	Michael Dorner	Managing director	Austria	Card producer	**AD6**
Injection moulding					
KRUNON	Jesper de Groot	Engineer	Netherlands	Plastic Product manufacturing	**AD15**
Circles Smart Crad (TTE)	Veit Wittke	Managing Director	Germany	Chip card producer	**AD16**
primold GmbH	Tobias Camek	Sales Manager	Germany	Plastic Product manufacturing	**AD18**
Sealect Plastics	Matt Poischberg	Director of Operations	US	Plastic Product manufacturing	**AD23**
Recycler					
PLASTIX	Fenella Metz	Business Development Project Manager	Denmark	Recycler	**AD17**
Fil & Fab	Yann Louboutin	Co- Founder	France	Recycler	**AD21**
NGOs					
Brigada do Mar	Simão Acciaioli	Co- Founder	Portugal	NGO	**AD1**
Pacto Portuges Para os Plasticos	Pedro Simão	Coordinator	Portugal		**AD5**
CascaisSea	Miguel Lacerda	Founder	Portugal	NGO	**AD2**
WWF Portugal	Rita Sá, Nuno Barros	Ocean fishery, Ocean plastic experts	Portugal	NGO	**AD9**
Ghostnetwork	Christopher Storey	Founder	Portugal	NGO	**AD13**
Fishery /Harbours					
DocaPesca	Carla Tabaio	Director of Marketing and Innovation	Portugal	Fishery / Harbours	**AD4**
Best Practices					
BUREO	Ben Kneppers	Co - Founder	Chile	Best Practices	**AD3**
tide ocean	Beat Baehler	Head of Sales	Switzerland	Best Practices	**AD19 | AD29**
Net Your Problem	Nicole Baker, Sara Aubery	Founder, Head of Business Development	US	Best Practices	**AD26| AD27**
Financial Institutions					
Volksbank eG.	Matthias Legner	Payment Advisor	Germany	Financial Institutions	**AD24**
Santander	Nuno Freire	Head of University Money Club	Portugal	Financial Institutions	**AD25**
SIBS	Gonçalo Campos Alves, Beatriz Nieves	General Partner, Key Account Manager	Portugal	Financial Institution	**AD20 | AD28**
Universities					
University of St. Gallen (HSG)	Dr. Tabea Bereuther	Sustainability Manager	Switzerland	Higher Educational Institutions	**AD8**
WHU – Otto Beisheim School of Management	Dirk Jonach	Associate Director IT-Infrastructure	Germany	Higher Educational Institutions	**AD10**
University of Reading	Nathan Harvey	Campus card systems manager	UK	Higher Educational Institutions	**AD11**
University of Bath	Laurence Lockton	Campus card systems manager	UK	Higher Educational Institutions	**AD12**
Transportation					
Heinz Huber Logistic	Sebastian Huber	Controller	Germany	Logistic company	**AD22**

Link to interview transcripts:

https://drive.google.com/file/d/1OmAf8qrvEWyEggOruNgefbe5KA6PxStA/view?usp=sharing