Redefining Transparency in the Fashion Industry

A study into the role of Digital Product Passport in shaping producer practices and consumer behaviour

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Disclaimer: I hereby declare that this dissertation is my own original work and has not been submitted before to any institution for assessment purposes.

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Abstract

Achieving sustainable practices within the fashion industry presents a particularly daunting challenge when compared to other sectors. As the second most polluting sector and a large contributor to greenhouse gas emissions, transformation is needed and fast. The fashion industry's supply chains are often characterized as a complex network of processes, lacking transparency and traceability. Consequently, a solution is emerging in the form of digital traceability, as the European Commission is proposing the adoption and integration of the Digital Product Passport (DPP) in the market. This tool is essentially a product's ledger, enabling material-to-product traceability across a multi-tiered value chain throughout the product's entire lifecycle.

On one hand the study relies on interviews with professionals in different areas of the fashion industry, providing an overview into the future impact of the DPP on producers, delving into transparency and traceability practices in supply chains, informational governance, as well as possible upcoming challenges. On the other hand, through a consumer-focused questionnaire, the study explores how consumers might perceive and utilize the DPP once it is implemented and how it will shape future purchases.

Results indicate that the DPP might encounter challenges, including supply chain complexities, producer resistance and technological barriers such as blockchain integration. Emphasizing transparency and stakeholder education, the study discusses the role of the European Union as well as the business opportunities and strategic advantages associated with it. Furthermore, it identifies consumer awareness as a crucial aspect in the successful integration of the DPP, noting a positive link between awareness and inclination to use the tool to make more sustainable purchasing decisions. The study underscores the role of consumer education in shaping sustainable behaviours and facing challenges such as consumer scepticism and greenwashing awareness.

Overall, it provides essential insights for policymakers, industry stakeholders and educators to enhance the effectiveness of this upcoming innovative tool that can reduce the fashion industry's environmental impact and promote more sustainable practices.

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CEAP	Circular Economy Action Plan
CLT	Construal Level Theory
DPP	Digital Product Passport
EC	European Commission
EPR	Extended Producer Responsibility
ESPR	Eco-design for Sustainable Products Regulation
SMEs	Small-medium enterprises

Chapter 1: Introduction

1.1 Background

Fashion is often seen as a symbol of self-expression, identity, creativity and may even be considered art. It is a dynamic industry that employs hundreds of millions around the globe and generates a significant amount of revenue. Over the years it has become increasingly globalized with clothing items being manufactured in one country, designed in another, and distributed and sold on a global scale. As a result of this, clothing production is the third most polluting manufacturing industry in the world, responsible for around 10% of global carbon emissions (World Bank Group, 2019). To better understand the dimension of the issue with the fashion industry, it is important to realize that the EU alone generates 12.6 million tons of textile waste, with every person wasting 12kg of waste every year (Press Corner, 2023). Over time, this issue has been further accentuated by the emergence of the 'fast fashion' phenomenon. The term 'fast fashion' refers to the shift in the fashion industry that led to a colossal increase in production at lower costs due to the rapid turnover of trendy clothing styles. Fast fashion involves 52 fashion seasons meaning that once a week, every year, new collections come into stores and the old ones are disposed of. Currently, only 22% of textile waste is handled, separately collected, and recycled or re-used (Press Corner, 2023). The remaining 78% is often incinerated or put in a landfill. As a society, our current production and consumption patterns are not sustainable. We keep on extracting raw materials and transforming them into products, without taking into consideration the damaging consequences of disposing of these. Garments have become disposable, easily replaceable, and inexpensive to consumers; it is now more convenient to discard old items and buy new ones rather than attempt to repair, redesign or recycle them. The reality, however, is that large-scale production at a lower cost has a bitter price as it imposes a heavy burden on our planet with significant social costs. The collapse of the Rana Plaza in 2013, a textile factory in Bangladesh, where over 1,100 people lost their lives, shed light on the appalling conditions workers suffer through and the true cost of our low prices and excessive consumerism (Butler & Begum, 2023). Consequently, the fast fashion industry has faced increased scrutiny and criticism over its harmful practices and damaging environmental impact. There have been ongoing efforts by consumers, activists, and companies to promote awareness of the unsustainable and unethical practices of the industry.

Even though today's linear model based on the 'take-make-dispose' concept is still very much present, there is no denying that production schemes, as well as consumer behaviour, are slowly shifting towards more circular approaches (Ellen MacArthur Foundation, 2017). Brands have begun taking several courses of action resulting in an increased focus on sustainability. Efforts such as implanting greener methods of production, launching initiatives, incorporating more eco-friendly materials, decreasing their carbon footprint, and committing to greener practice standards. In the past few years, consumers have become more environmentally aware, impact environmental studies have been conducted, and transparency standards for producers have significantly increased and impacted the industry. Even though it can be argued that they are being compelled to do so, through compulsory regulations and the risk of financial penalties, to transition to a more environmentally conscious economy.

Circular economy is now high on national agendas, and the will to move away from the 'take-make-dispose' model is growing. Several policies, incentives and measures are in place that help accelerate the transition and enforce much needed change. Initiatives such as the Extended Producer

Responsibility (EPR) which is composed of rules to make producers responsible for the full lifecycle of their products. In July 2023, this was extended to textile products as well as the management of textile waste. Many other initiatives are now appearing, such as take-back schemes, clothing swapping, second hand stores and many others. The French government, for instance started a "repair bonus," allocating money for clothes to be mended and ultimately cutting waste (Willsher, 2023). It is however still unclear how to govern and successfully implement a circular model. Although a transition to a circular economy can begin with small wins, it does require a fundamental shift in not only producer but also consumer behaviour.

The **Digital Product Passport (DPP)** emerges with the purpose of enabling and accelerating the transition to a circular economy. The European Commission is deploying this tool and intends to facilitate sharing of product information related to circularity and value retention practices amongst stakeholders. The DPP aims to (1) boost material and energy efficiency, (2) extend products lifetimes, and (3) optimizing design and manufacturing, (4) inform consumers to make more sustainable choices, and finally (5) help to verify compliance (Cirpass, 2024). In turn, businesses will be able to create and retain value through a more sustainable circular model. The DPP, among other initiatives, must be tested in order to determine their true effectiveness and influence on behaviour, and they must be created with all stakeholders involved, not simply implemented without thinking long term and assessing their social, economic, and environmental impact. The digital product passport holds the potential to revolutionize existing business models, creating new avenues for value creation through transparency, traceability, and accountability in the fashion industry.

1.2 Problem Statement

Initiatives to accelerate the transition towards a circular economy must no longer be used as a mask to cover the fact that the fashion industry, especially fast fashion, is simply unsustainable and major problems such as overproduction, the prioritization of profit above all else, as well as mass consumption must be addressed. Brands repeatedly produce short-lived and slow-moving 'sustainability' campaigns using loopholes in the system to do so. Therefore, different steps must be taken to foster the complex interplay between producers and consumers.

The digital product passport has started to attract high attention from all stakeholders and a multitude of research is being done to investigate its impact on products. It is a relatively new concept and in the pilot stages therefore, the relationship between the DPP with producer, but especially consumer behaviour is a relatively new area of study. Furthermore, the fashion industry often faces challenges that revolve around information asymmetry from producers, whereas consumers struggle with accessing comprehensive and transparent data regarding their purchases. The true impact of the DPP remains uncertain, ongoing case studies are underway, however, there is a notable absence of perspectives from both producers and consumers in the matter. A thorough examination of both these stakeholder´s points of view is necessary to obtain a holistic understanding and to explore the potential benefits and ramifications of the implementation.

It is important to note that the DPP holds the potential to reshape producers' conventional practices. The expectation is that producers in the industry will undergo major changes once the DPP is implemented in their current processes. This shift requires an understanding of how producers will navigate and adapt to these changes, the strategies they might employ, the operational adjustments and the shifts in communication. These adaptations are crucial for producers to align themselves not

only with the DPP requirements but also with the changing expectations of consumers. Therefore, throughout this research, a greater emphasis will be placed on transparency, traceability, and heightened consumer scrutiny.

Moreover, the effectiveness of providing information through the DPP in changing or affecting consumer behaviour is a matter to be explored. Even though this type of information isn´t solicited by every consumer, having access to comprehensive data can allow consumers to make more informed choices even if their preferences vary. The impact of this passport on behaviour will depend on the target audience's preferences. While the tool may serve as a guide to those who actively seek information on the sustainability attributes of some products, for others it may simply be another feature on their product's label. Nonetheless, it can create awareness and educate consumers about the impact of their choices, for instance knowing and understanding the carbon footprint of a product may prompt consumers to consider alternative, less environmentally degrading choices.

1.3 Research Goal and Research Questions

The aim of this paper is to explore the relationship between consumers' intentions and attitudes as well as producers' behaviours with initiatives such as the digital product passport. By understanding this relationship, a more in-depth exploration of the psychology behind sustainable consumption choice as well as practical implications for both policymakers and businesses can be studied. Additionally, this information can offer insights into how to shape future digital product passports as a successful and useful tool for both consumers and producers.

Based on the above mentioned the central research question (RQ) that can be derived from this context is: **What are the potential implications of the Digital Product Passport for stakeholders in the fashion industry?**

To effectively answer all the variables of the main research question, the following sub-questions (SRQ) have been formulated:

Producer impact:

SRQ1 - What challenges are anticipated for fashion producers to face when integrating the digital product passport into their operations?

Consumer impact:

SRQ2 - How will consumers perceive and utilize the digital product passport when making purchasing decisions for fashion products?

SRQ3 - What strategies can be employed to enhance the effectiveness of this tool in promoting sustainable consumption behaviour?

1.4 Thesis Outline

The introduction chapter briefly outlines the relevance of the study, the sustainable product initiative and digital product passport. It also includes the objective, main research question, sub-research questions and the conceptual framework of the study. Following this introduction on the challenges of the textile industry and the implementation of the DPP, Chapter 2 offers the theoretical framework, provides a comprehensive literature review of the topic, and discusses the policy legislations of the EU that will be in place. The methodology of the empirical research is described in Chapter 3, which is broken down into to two sections: the producer interviews and a consumer survey. Chapter 4 discusses the results of the research, while Chapter 5 involves an in-depth discussion of the results along with limitations and further research recommendations, which can be found in Chapter 6. The research conclusion can be found in Chapter 7 along with the business implications of this research and recommendations. This is followed by a references list and the Appendix.

Chapter 2: Literature review

This chapter sets out the theoretical framework of this research. A text analysis in academic literature and journals was conducted in order to gain a better understanding of the current setting and state of the DPP in the textile industry. Looking into sources such as newspapers, pilot projects (case studies), textile companies' websites. Furthermore, a doctrinal approach will be applied by going through EU legislation documents regarding DPP requirements, as well as keeping up with updates and changes to the regulations applicable to this industry.

2.1 Regulatory Framework for the Fashion Industry and the DPP

2.1.1 The EU decision making process

The European Union's (EU) decision-making process involves three main institutions: the European Parliament which presents the citizens, the Council of the European Union, representing the government and the European Commission, handling the overall interests of the EU (The Council of the EU, 2024). The ordinary legislative procedure is commonly used where these three institutions work together on a legislation.

The process begins with an assessment conducted by the Commission of potential impacts of new initiatives considering three factors, economic, social, and environmental. An impact assessment is created, gathering input from several sources including industries, national authorities, amongst others. Once reservations and issues are dealt with, the Commission proposes legislation to be reviewed, amended, and negotiated by the Parliament and Council. The final step is the adoption of a proposal into a law requiring an agreement between both the Parliament and the Council along with a publication of a joint text in the EU's Official Journal.

2.1.2 Legal acts of the European Union

A directive is a binding legal act that sets out a goal that all EU member states must achieve, allowing them flexibility as to how to reach them (European Union, 2022). To place an EU directive into effect in a member state's legal system, the European Parliament and the Council of the European Union must first adopt the directive based on proposals from the EC and publish them in the Official Journal. Members states are then required to transpose directives provisions into their national law. Once again, each member state has the flexibility to choose the specifications to which the directive is implemented, the outcome however, must align with the directive's objectives. The directive becomes part of the national legal framework of each member state once transposed, in other words, it has the same legal status as any other national law. The EC then monitors to transposition of these directives, to ensure member states are being compliant, and in case of inadequate implementation, the Commission may take measures to initiate infringement proceedings. It is important to note that EU directives have no direct effect on individuals or business, instead, it sparks the enactment of national laws. Regulations on the other hand, as a primary source of EU law, are directly applicable to individuals and entities in all member states and the provisions outlined are binding, taking precedence over conflicting national laws (Maciejewski & Bux, 2023). These are typically based on articles within the EU treaties or specific legal provisions and are adopted in a particular policy area. Ensuring a high level of standardization and uniformity are some of the main purposes of regulations. Usually, the data on which regulations must come into force is delineated and a failure to comply with the provisions can lead to legal actions being taken by the EC against member states. It is important to note that while directives require transposition into national law, regulations are immediately binding and do not require a separate process for their implementation.

2.1.3 Sector Specific EU Policy

The sector specific EU policy started with the Sustainable Development Goals (SDGs) of the United Nations with the purpose of addressing global challenges and fostering a more sustainable and fairer world. The UN stated that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"(Carpentier & Braun, 2020).

The EU has a strong leadership role globally and regionally, in implementing the Agenda 2030 for sustainable development and needs to be translated into strategies and actions. In line with the UN, the triple bottom line concept reinforces the idea that development should not be pursued at the expense of social well-being, economic success, or environmental credibility. The concept has 3 dimensions; environmental, social, and economic, as can be seen in Figure 1. The idea behind the concept is that firms commit to measuring their overall impact taking into consideration the 3 Ps: People, Planet and Profit (McKinsey & Company, 2022). Instead of solely focusing on generating Profit many believe that a firm's success heavily relies on financial performance and the profit it generates for its stakeholders, and the growth mindset. However, there is power in understanding the positive effect businesses can have in the world without affecting companies' profitability. The component, people, highlights the commitment to people; what we do impacts people today and serves future generations. Finally, the planet component is concerned with making an overall positive impact. While businesses can be the greatest contributors to climate change, they also possess a better change of driving change. This effort should not rely on the largest corporations but

focus on reducing our carbon footprint, choosing better materials and products, and taking steps to ensure better sustainability practices.

Figure 1: The 3 pillars of the UN Sustainable Development Goals (Saari et al., 2022)

One of these above-mentioned initiatives is the European Commission's Green Deal, which aims to reduce emissions by 55% by the year of 2030 (European Commission, 2020). Hence, the Commission has presented a series of proposals with the aim of lowering overall emissions and promoting circular economy principles. As previously mentioned, the concept of circular economy has become more prominent on the agendas of both policymakers and businesses (Geissdoerfer et al., 2020). Therefore, the Circular Economy Action Plan (CEAP) was released in order to accelerate the transition towards a greener, sustainability-focused, and resource-efficient economy (COM/2020/98). The term circular economy refers to a "model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible" (European Parliament, 2023).

Moreover, the Single Market for Green Products Initiative aimed at enhancing information on the environmental performance of products proposing the Product Environmental Footprint (PEF) as a common lifecycle assessment to measure environmental impact (Brown, 2023). As the PEF aims to make environmental information available to consumers, the DPP emerges to complement it with transparency and accuracy throughout a product´s lifecycle. Integrating both these tools ensures that the overall environmental impact information remains associated with products. This allows for a better assessment of the product's longevity and helps to improve sustainability strategies and circular strategies such as recycling, repair and reusing. The product's PEF should be visible on the DPP fostering consumer trust and a more environmentally conscious market. Additionally, the Twin Green & Digital Transition, which aims to transform Europe into a green, digital, and resilient economy (Muench et al., 2022). It is a strategy aimed at integrating sustainability and digitalization to achieve carbon neutrality by the year 2050. Sustainable digital technologies likely encompass a range of innovations from optimizing industrial processes through data to the development of more eco-friendly digital solutions. When used responsibly, these technologies have the potential to contribute to reducing carbon emissions and promoting sustainable practices across industries. The DPP can be considered part of this digital transformation by enhancing visibility into the environmental footprint of the product.

An assessment conducted by the EU commission showed that the textile industry is one of the most impactful sectors (*Interviewee I08*, personal communication, January 2024). It is the third most polluting in land and water use, and the projections showed that if nothing was done to prevent this,

it will grow exponentially, notably linked to the phenomenon of fast fashion. To address the ever-growing climate and environmental impact of textiles, the EU Strategy for Sustainable and Circular Textile was created (COM (2022) 141). It lays out sector-specific goals and measures to achieve a more circular and sustainable future, aiming to make textile products, to be more durable, recyclable, free of hazardous chemicals and socially sustainable. This strategy comprises three main initiatives. The first one is the non-regulatory initiatives, also referred to as soft law initiatives, involving outreach campaigns towards consumers and companies, awareness campaigns, and the Transition Pathway for the textile's ecosystem of the future (European Commission, 2023). The Transition Pathway initiative represents a comprehensive and collaborative effort to drive sustainability, digitalization, resilience, and transformation within the textile industry, encouraging actionable commitments. It is a co-creation exercise with stakeholders to produce a series of actions for achieving a circular economy, digitalisation, resilience, and sustainable competitiveness by bridging investment and innovation gaps.

Furthermore, the commission is working towards collecting commitments from the industry to go beyond the regulatory minimum in several fields, including social and environmental sustainability (*Interviewee I08*, personal communication, January 2024). Inviting stakeholders within the industry to take part and participate in this discussion, allows for different perspectives, experiences, and expertise to be shared, facilitating this transition. The second initiative includes funding, which helps the industry adapt to the new reality and the upcoming regulations. It facilitates the transition towards a greener and more digital industry, going beyond the regulatory minimum. The final initiative falls under the regulatory category, which is where the Ecodesign regulation comes into play.

In addition to this, stakeholders will have access to information such as the environmental impact of their purchase. The proposal also addresses the issue of the destruction of unsold consumer goods, introducing measures to incentivize the consumption of sustainable products. However, these compliances may present challenges, as well-intentioned companies may not benefit from these measures, and businesses with fewer commitments to sustainability may not be effectively deterred. Furthermore, as part of the EU strategy to achieve a more sustainable, circular economy, on the producer side, the Extended Producer Responsibility (EPR) was introduced (COM (2022) 677). It mandates that producers assume responsibility for their products throughout their lifecycle, ensuring that these are properly disposed of and recycled. This initiative will, in turn, make producers more aware when designing their products with end-of-life considerations in mind. Regarding this proposal, the commission will also review the Textile labelling regulation introducing the mandatory disclosure of certain information, such as the sustainable and circular parameters and location of the manufacturing process. On the consumer side, the Consumer Empowerment Directive, aims to ensure that environmental claims are dependable, understandable, and fair (Directive 2024/825). This allows for traders to operate on a level playing field and enables consumers to choose products that are genuinely better for the environment than competing products. It also aims to combat misleading commercial practices such as greenwashing and premature obsolescence of goods.

Lastly, and most importantly, the new EU proposal for Eco-Design for Sustainable Products Regulation (ESPR), is set to include "the creation of a digital product passport" (COM/2022/142C). As per the regulation, this tool is expected to increase transparency and efficiency along the supply chain and provide consumers with more comprehensive information. However, data about the supply chain of products is rarely shared with all stakeholders, and so DPP was created as a tool to facilitate the implementation of circular economy principles. As outlined in the ESPR, the DPP might encompass information requirements such as product durability, reusability, upgradability, reparability, energy,

resource efficiency and a ban on substances that hinder circularity (COM/2022/142). The ESPR proposal lays down a framework for defining ecodesign performance and information standards in products, accentuating sustainability, and circularity across a range of product categories. Moreover, it aims to streamline monitoring processes and facilitate enforcement of EU regulations by Member State authorities and, therefore, is poised to evolve into a valuable market intelligence tool.

The EU is introducing legislation according to 3 pillars of intervention to help a more comprehensive understanding regarding the upcoming changes (*Interviewee I08*, personal communication, January 2024). The first one is product legislation. Which will introduce rules on the characteristics of products and what obligations companies will have to comply in order to place them on the market. The second one is consumer information conveying to consumers information that help them make proper choices when purchasing and using textile products. And finally, sustainability, which is a global pillar not limited to the boundaries of the EU which includes environmental and social sustainability. The first two pillars are very linked by ESPR with DPP being its implementing tool.

2.2 The Digital Product Passport

The European Commission defines a Digital Product Passport as a "product-specific data set, which can be electronically accessed through a data carrier to electronically register, process and share product-related information amongst supply chain businesses, authorities and consumers"(Götz, 2022). The adoption of this tool aligns with the EU´s effort to promote sustainable production and consumption. Currently under development by the EU, this tool aims to enable more transparency and provide detailed information throughout a product's entire supply chain, facilitating data sharing with all stakeholders, including consumers. It serves as a new communication channel between companies/producers and their communities. The DPP supports three policy objectives: legal compliance, increased environmental sustainability and to promote circularity (Migliorini, 2022). Additionally, it aims to align with the principles of the 9Rs, where recyclability is prioritized as a last resort. In accordance with EU regulations, producers will have to comply with the DPP requirements in order to sell and produce inside the EU market space, in an effort to enhance transparency in supply chains, operational processes and data sharing (WBCSD, 2023). The introduction of the DPP reflects the EU's ambition to promote transparency and sustainability and empower consumers to make more informed decisions. Moreover, the implementation of this tool signals commitment to make the fashion industry accountable, responsible for reducing its environmental footprint, facilitating product traceability, and favouring ethical practices. By bridging information gaps, the DPP serves as a catalyst for industry-wide shifts towards a more sustainable and circular economy.

The DPP can be viewed as a vital step in advancing the transition towards a circular economy, as it compels manufacturers to fully disclose information and design products with circular economy principles in mind. The current linear economic model, characterized by excessive resource extraction and waste generation, aggravates climate change, biodiversity loss and natural resource depletion. Traditional business models often prioritize profit at the expense of environmental and social costs, leading to more unsustainable practices, particularly in industries like textiles.

The DPP will encompass several functionalities, involving the collection of product information across the products lifecycle (WBCSD, 2023). In terms of information, it aims to provide "clear, structured and accessible information on the environmental sustainability characteristics of products" (COM (2022) 141). This initiative aligns with the European Commission's strategy for sustainable and

circular textiles, emphasizing the importance of full transparency and data availability at a high level from all value chain actors. By enabling circularity, and fostering collaboration among all stakeholders, including producers, consumers, and regulators, the DPP is poised to have a profound impact, given that DPP compliance will be mandatory for products sold within the EU market.

2.2.1 Deconstructing the DPP: Navigating the technological aspects.

The DPP will focus on two crucial aspects: system, and data (Jansen, 2023). The DPP system itself will not be accessible to users, posing a significant challenge for policymakers to establish standardization and harmonization across all industries, particularly regarding identification, access management, and security authentication. Furthermore, the DPP data will be specific to each product group and identified through a separate legislative process. This will involve the introduction of a framework regulation, allowing the EU to define the data included in the DPP, its accessibility rights, responsibility, and storage duration in collaboration with stakeholders. The management and storage of this data remains undecided, nonetheless, a cloud or blockchain technology, or a combination of both are potential solutions (WBCSD, 2023). The last crucial functionality is that it provides easy access to this data to all stakeholders. To access the information, a data carrier will be placed on the physical label of the clothes. Currently, the technology is not yet decided as there is ongoing open public consultation (*Interviewee I08*, personal communication, January 2024). The idea is to allow people to access this information by scanning a QR code, NFRD or NFC on their phones.

The electronic repository of information for the DPP, will not be developed by the commission, instead companies will take on this task. The commission's role is to establish technical standards including language and IT specifications, to ensure interoperability among these developed systems (*Interviewee I08*, personal communication, January 2024). The specific access rights will be differentiated per stakeholder group on a need-to-know basis. The DPP will convey information to three groups of recipients. The first one being companies, the information shared by these stakeholders is relevant not only to other companies, but also to all those involved in production. Supply chains in the textile industry feature decentralization with minimal consolidation and vertical integration. Predominantly composed of small-medium enterprises (SMEs), these supply chains involve numerous small economic players distributed globally. Consequently, in order to produce the information for the DPP and accurately characterize the products, data from these dispersed supply chains must be shared. The objective is to transform the DPP into a tool not only for external stakeholders but also for companies themselves, enabling them to understand the characterize of their products comprehensively and be able to trace their journey. A subset of that information will then go to market surveillance authorities, privileged information is protected and as well as IT restrictions. This will enable authorities to check whether products comply with the regulation. The last subset of information belongs to consumers, information at this stage becomes public and serves as a resource for informing purchasing decisions.

According to the CEAP, priority for the adoption of the DPP will be given to electronics, batteries and vehicles with the textile industry following closely behind (COM (2020) 98). However, the specifics of how the DPP will be implemented for each product group remains unclear. Regarding the DPP application, the EC intends to implement it at either at item, batch, or a model level, depending on factors such as size and environmental impact. At an item level, each individual product would have its own DPP, providing detailed information to that specific item, while at a model level, a single DPP could cover an entire range of items such as electronics or vehicles. Clothing items, on the other

hand, are anticipated have a DPP primarily applied at a batch level, wherein multiple items are grouped together in batches, sharing a common identifier.

As negotiations are still ongoing, and the DPP is in its early stages, the EC has not yet presented an official timeline for its implementation. However, despite the current stage of this tool and the ongoing developments, a rough timeline and estimation can be speculated.

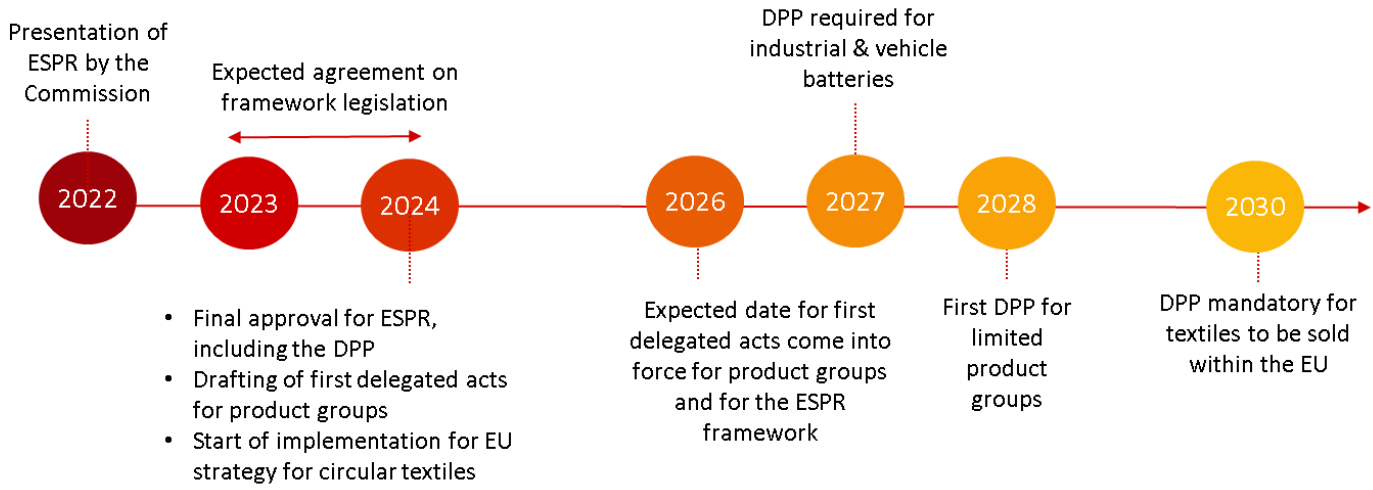

Figure 2: Summary of the expected DPP implementation timeline according to interviewed experts and WBCSD (WBCSD, 2023).

Given the wide-reaching scope of the ESPR framework, which encompasses the DPP and applies to virtually all products, the EC is working towards the introduction of specific requirements for the various types of products, including textile products by a delegated act (*Interviewee I08*, personal communication, January 2024). A delegated act serves to supplement the non-essential elements of a legislation (Manko & Del Monte, 2021). It will not only explain the architecture of the DPP itself in technological terms, but also the actual requirements that products must comply with to introduced in the EU market.

2.2.3 Anticipated DPP information requirements

While the specific requirements for the DPP are still in developmental stages, preliminary insights from article 7 and Annex III of the ESPR as well as other sources, offer a glimpse into the potential features of the tool (Westerlund, 2023). These encompass technical aspects, including product identification and the declaration of conformity, ensuring compliance with EU requirements through technical and compliance documentation. Furthermore, the DPP is expected to include information regarding the origin and journey of products, along with performance data such as energy efficiency ratings and the overall environmental footprint (Neligan et al., 2023).

The EC primarily aims to focus on the environmental aspects and excluding the ethical or social aspects of product information and supply chains, which includes, durability, recyclability, and recycled content (*Interviewee I08*, personal communication, January 2024). This encompasses maintenance instructions, user manuals, and repair guides, along with end-life measures for the proper disposal of products. Furthermore, restrictions on harmful substances, traceability of

products, material composition, compliance with EU ecolabels and product certifications can also be anticipated. Moreover, the EC intends to introduce two types of requirements: information and performance. The information requirements aim to establish standardized criteria mandated by law to assess the environmental friendless of a product accurately. The begins with identifying which product aspects are pertinent for textiles, followed by a definition of relevant parameters. For instance, a key parameter for durability is colour fastness in the use phase. Hence, when a product is marketed, the DPP will include information on the extent of colour fading after a specified number of washes. As for performance requirements, a minimum threshold must be set, beyond which a product cannot exceed. If a product exceeds a specified colour loss threshold after a certain number of washes, it cannot be placed on the market. This implies that products undergo testing measures to ensure precision in the data and reliability.

Moreover, authors such as Adisorn et al., (2022) and Götz et al., 2021 have outlined potential data requirements beyond those suggested by the EU regulation. These include aspects such as product ownership history with records of previous owners and transfers of the product, details regarding product warranty and service history to facilitate support. Lastly, the authors suggest a necessity of information on intellectual property rights, copyrights and patents associated with the product. The evolving landscape of this regulation, coupled with changing industry trends, emerging technologies, and consumer expectations, is likely to influence the final information requirements. Furthermore, the EU is still unclear on whether these requirements with be standardized across industries or will differ depending on the sector, this matter is still being discussed (*Interviewee I08*, personal communication, January 2024).

2.2.4 Opportunities for a DPP Implementation

The DPP is a major step towards a circular economy and sustainable practices. The implementation of this tool will allow for products to not only be valued based on their functionally but also for their environmental footprint. This tool represents a major shift in the way products are designed, manufactured, and consumed. Supply chains in the fashion industry are typically characterized as being complex, intricate, and subject to tracking challenges. Therefore, for producers in the fashion industry, the commitment to become more transparent through an efficient data-based mechanism such as the DPP aims to improve interoperability, tracking, while making information more accessible. A detailed record of the products lifecycle has a range of advantages not only for producers but also for consumers. For producers, it can play a vital role in reducing resource costs, allowing suppliers to have access to real-time, scale and comprehensive data regarding energy and water expenses, for instance, which will enable efficient resource allocation and saving decisions. An overview of the entire supply chain, which is not yet the reality, can be transformative, enabling a more strategized approach to how to increase operational efficiency and decrease costs. Moreover, environmental, social and governance (ESG) activities are becoming a priority to investors, overall, it can be embraced and seen as a driver of value creation.

Consumers, on the other hand, will have different advantages. Considering EY´s future consumer index, 80% of global consumers demand transparency from companies and 61% want this information to help make more sustainable choices (Rogers & Cosgrove, 2021). By delivering authentic, truthful, and publicly accessible data not only builds consumers' confidence, but fosters loyalty and empowers individuals to make informed decisions that align with their values. This can in turn drive a more conscious and environmentally aware consumer culture. The DPP offers an array of

benefits for consumers including facilitating the comparison of products based on sustainability attributes, access to care, maintenance and usage instructions of their products, as well as durability. It can even be extended to the point where it allows consumers to locate recycling services such as encouraging responsible end-of-life measures for the disposal of clothing items.

A successful implementation of this tool has the potential to inspire similar efforts and spread the concept, triggering a broader positive impact to the wider public, governments and organizations. It can serve as a powerful tool for brands to engage and communicate with consumers, sharing captivating stories, inspirational looks, and support information. This knowledge provides companies the ability to demand higher sustainability standards for their respective supply chains, holding stakeholders accountable for greener, more ethical practices.

2.2.6 Applications related to the DPP: Case Studies

The Battery Regulation Proposal

The new EU batteries regulation which came into force in August 2023, extends to all batteries manufactured and sold within the EU (COM/2020/798). The rules of these regulations extend beyond producer responsibility and require due diligence of supply chains to involve social and environmental risks. A new label will allow more accurate information about the environmental impact of batteries to stakeholders. The aim is to reduce environmental and social impact as previously mentioned, promote a circular economy, and but also strengthen the flow of the internal market. Based on this, there are a few main areas of focus that will be present on the label: sustainability and safety (carbon footprint, hazardous substances information), supply chain management, labelling information and end-of-life management. All new batteries will be required to have these labels as well as QR codes detailing the above-mentioned aspects by 2026 for the labels and 2027 for the QR code. Even though the digital battery passport is still not yet mandatory, this regulation is already changing the dynamics of the sector. Phased implementations are already taking place, such as rules on conformity assessment procedures and obligations to business entities as well as end-of-life management measures. By August 2025, as per the regulation, penalties will be applied to those who infringe the regulation. This can serve as a reference point, setting precedence for the textile industry. It is laying groundwork for a shift towards transparency, accountability, as well as ethical considerations. The textile industry can stand to gain invaluable insights as to the changes made and the sector experience and ultimately learn and foster a more evolved path.

Pharma Serialization

Serialization has long been established by the pharmaceutical sector as a tool to help trace drugs throughout the entire supply chain. The pharma serialization is a unique code assigned to each drug that can track the lifecycle events of products and tie components to an identified product, following GS1 guidelines (Hähn & Reingardt, 2017). In order for the product to be verified, it must comply with a few data elements such as a serial number, a batch/lot number, a product identifier, and an expiry date. This aims to assure consumers that the medicines they rely on are not falsified. The falsified medicines directive was introduced to ensure that medication is safe and controlled, with serialization being used to ensure that occurs through verifiable and authentic information (Directive 2011/62). According to GS1 this identification standards are used not only to identify products but

also can also serve to track the entire lifecycle of the product, from the design process, all the way to the disposal of the item.

2.3 Producer Impact

2.3.1 Fashion Industry Supply Chains

"Supply chain management links all the supply interacting organizations in an integrated communication system to manage high-quality inventory in the most effective and efficient manner" (Basak et al.,2014). The ability to manage supply chains relies on continuous improvements with the purpose of improving profitability and ensuring the survival of all those that take part in the value chain. Throughout the entire process data is collected at every step and analysed to identify gaps and future improvements. Understanding and collecting this data allows businesses to have control over the process, reduce errors and, ultimately, costs, increase operational efficiency, streamline processes and finally, improve the overall quality of products for consumers. However, supply chains can span across the globe, making it difficult to track some processes, leading to possible violations of environmental guidelines as well as labour conditions.

Supply chains must be flexible enough to be adjusted to all kinds of challenges such as global inflation which raises the costs of crucial aspects in processes such as energy consumption and distribution (Ricadela, 2023). They involve the coordination and integration of various stakeholders and processes ranging from the design and planning, flow of raw materials, manufacturing, distribution until it becomes a finished product for consumers to purchase (Seddiqe & Basak, 2014). The typical supply chain for fashion relies on seasonal collections it generally takes around 18 months (Hansson, 2011) and the process follows the following steps:

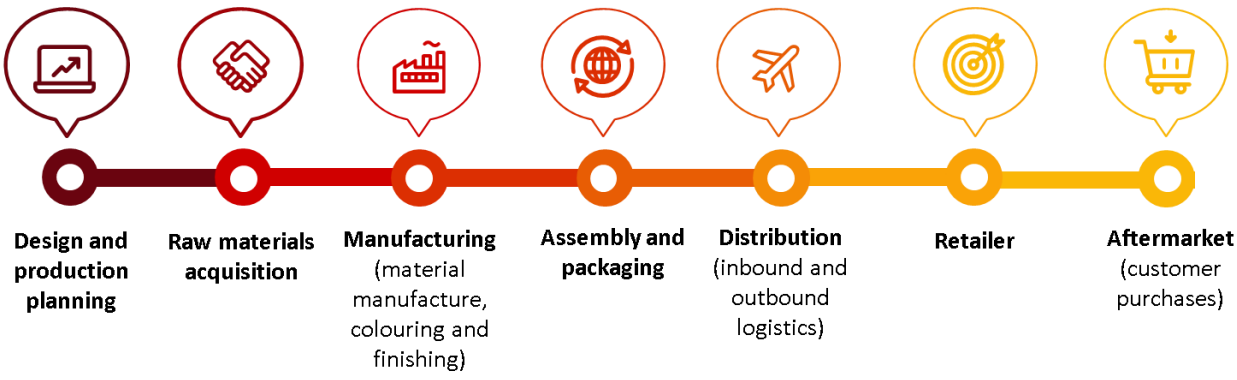

Figure 3: Example of a general supply chain process of textiles

Every garment requires basic materials, in the design and product planning stage, new designs are envisioned, details of fabrics are established, and materials are considered considering market trends. Sketching and prototyping are integral steps, allowing for the creation of concepts and the assessment of the feasibility of designs. On the product supply planning side, capabilities are defined considering customer demand, speed to market and risk mitigation through the process (Blaazer, 2023). This stage also involves decisions on the quality of materials and production costs

(Dissanayake & Sinha, 2015). Following the design stage, the focus shifts towards sourcing raw materials such as cotton and wool as well as natural or synthetic fibres and other materials. The different parts of clothing products are acquired from various suppliers and include components such as fabrics and trims. Once again, quality and costs are considered and, in some cases, ethical sourcing practices. These materials are subject to testing to ensure they meet safety and regulatory standards. An efficient management of the supply chain at this stage requires establishing a relationship with reliable and trustworthy suppliers and monitoring processes. Once these materials are acquired, the manufacturing phase takes place. It involves a series of processes such as cutting the selected materials into desired patterns sewing to create the final clothing item (Blaazer, 2023). These final pieces are then assembled and inspected for quality assurance as rigorous checks must be performed to identify and correct defects. The products are then carefully packaged to be protected during transit and storage (Sampson, 2023). The finished products are ready to be moved to distribution centres, which often involves complex logistics, management of volumes and international shipping. Therefore, efficiency becomes key as products must be stored properly and distributed to retailers, ensuring timely and accurate order processing. Inventory management and optimization is also an important part in this stage in meeting demand without creating unnecessary excess of stock products. In the retailer stage, clothing items are marked with prices to then be sold to consumers. Products are then presented in physical or online stores. The final phase is the aftermarket, where consumer purchases their items. At a later stage there might also be post-purchase services, such as repair options, customer support or additional information regarding the products to enhance customer satisfaction as well as end-of-life measures.

Fast fashion supply chains, such as the Inditex group, slightly differ from the typical model. These supply chains are characterized for its rapid-paced and agile production, short product development cycle and faster response times to the ever-evolving consumer demand (Cachon & Swinney, 2011) & (Barnes & Lea-Greenwood, 2006). The Inditex group is known for its commitment to what is called a ‘vertical integrational model' in its operations (Mafalda & Morgado Costa, 2017. This implies that certain stages of the chain are consolidated within the company itself, meaning that some production processes are manufactured in-house while others are outsourced to other manufacturing facilities. The in-house production process is more capital-intensive but also value-added intensive; these include raw material acquisition, design, packaging, and distribution, amongst others (Mafalda & Morgado Costa, 2017b). The outsourced manufacturing process involves taking production lines to other countries due to higher industrial output capacity, this process is more labour intensive, with a primary focus on sewing. The constant need for new, original, diverse, and cheap fashion collections significantly amplifies the uncertainty involved in accurately predicting the dynamics of the market. While the elevated demand forces brands to keep a larger inventory stock, this must be carefully managed to prevent significant financial losses caused by oversupply. To keep up with the constantly shifting market and its trends, Inditex developed a strategic quick-response supply chain, making the group a pioneer in the industry. This design-to-retail chain has a cycle of around 8 months, along with precise monitoring and predictive forecasting model to align with the demand fluctuations (Sitaro et al., 2020). Furthermore, the organization of Inditex relies on taking a proactive stance based on active communication, allowing for information on regional trends to flow dynamically, adjusting its production based on this input.

Overall, fashion industry supply chain are intricate and global networks that require effective management practices. Implementing systems that provide real-time visibility into the chain tracing and tracking products is crucial as well as establishing effective communication channels to quickly respond to changes in demand and disruptions along the supply chain.

2.3.2 Sustainable Supply Chain Transparency & Traceability

Scholars argue that by digitally transforming industrial processes and employing tools like the DPP, data management will harness data to generate sustainability impact (Alojail & Khan, 2023). This involves analysing errors or hindering factors that keep the supply chain from running efficiently, make decisions for production planning to reduce lead times, and enhancing supply chain flexibility (Feldt et al., 2019).

Currently, there are no uniform definitions of the terms “sustainable” or “transparent” supply chains. (Schäfer, 2022) have defined it as the “visibility and disclosure of sustainable supply chain information between actors within and outside the supply chain”. This concept encompasses how companies and producers incorporate sustainability aspects into their supply chains, including factors such as ethical practices, decarbonization and recycling approaches. The pressure of shifting business models to become more sustainable has been growing, as there is growing concern regarding the manner which garments are produced and consumed (LeRolland, 2023). Due to globalization of the apparel supply chain, tracking all the suppliers involved in the manufacturing has become a difficult task. Moreover, this absence of a standardized definition reflects on the lack of concrete actions that companies must take to enhance data transparency leading to challenges in implementing effective strategies and initiatives.

There are two main data categories implemented by the EU. The first one being track and trace, which encompasses sets of information related to the producers as well as tracking and tracing products along the value chain. The second one is attributes, which include information related to circularity, sustainability, and compliance history, amongst other specifications (Saari et al., 2022). The DPP has the potential to expose the environmental impact of products, trace their origins, track progress, and make this information available to the relevant stakeholders. Additionally, it can optimize supply chains, facilitating the exchange of information concerning products and monitor operations throughout the entire value chain.

When discussing the future of fashion, the concept of transparency is mentioned quite often. The call for heightened transparent information is on the rise, not solely driven by consumer demand but also from various stakeholders such as academics and regulatory bodies (Liu et al., 2023). Transparency and accountability can help build and ensure consumer trust and loyalty, a positive image/reputation and influence consumers’ purchasing decisions. Nonetheless, it tends to be viewed by companies not as an advantage to consider but as a mandatory requirement they must adhere to avoid damage to their reputations and from financial risk point of view (*Interviewee I08*, personal communication, January 2024). A study found that manufacturers are the most important source of product information, meaning that digitalization, data-sharing practices, and communication with these stakeholders are essential for successfully adopting the DPP (Adisorn et al. (2021). Access to comprehensive real-time data helps build trust and accountability throughout the value chain. This business strategy is evident in sustainability reports and disclosure of information available on company’s websites, amongst other channels.

Supply chains will need to be reconfigured; instead of focusing on moving products forward, they should be adapted to facilitate a reserve flow of materials. In other words, products and materials should circulate, maximizing their utility along the chain while preserving as much value as possible. Businesses will be able to have access to clear and consistent real-time data related to energy and

water usage, carbon emissions, and the origin and distribution of materials/components, amongst others. This will, however, be a costly, time-consuming, and complex process, as the new capabilities will be required as well as resources. Furthermore, a key aspect of transforming supply chains is the reduction of carbon emissions across all points, focusing on aspects such as renewable energy usage, innovative material alternatives such as recycled polyester and plant-based alternatives, set and submit science-based targets for nature and regulatory readiness.

2.3.3 The Informational Governance Framework

In the rapidly evolving landscape, the Information Age is well underway, marked by technological advancements, the increasing influence of social media and the continuous creation of information; power dynamics among stakeholders are undergoing significant shifts (Westerlund, 2023). As knowledge becomes synonymous with power, the concept of informational governance arises as a framework that encompasses policies and practices to navigate the complexities of data management ensuring its effectiveness, accuracy, and integrity (Sargiotis, 2024). The globalized hyperconnected nature of our society today has facilitated the continuous creation, exchange, and utilization of information, as well as its ability to receive feedback, innovate and be marketed. However, the impact of the Information Age extends far beyond governance processes, influencing political landscapes and shaping the dynamics of civil society. Informational governance is described as "governing through information with a purpose to guide, steer, control, or manage sectors or facets of societies" (Soma et al., 2016). The model serves as a lens through which we can gain an understanding into how societal development affects emerging environmental and sustainability challenges.

Representing the informational governance model, figure 4 illustrates that institutions possess the ability through formal and informal rules possess the ability to influence stakeholders' behaviour by either encouraging or restricting behaviour, leading to the restructuring of societal institutions. The figure explores 4 main themes: processes of information construction, new technologies, qualities of accountability and transparency and institutional change for governing change. The second theme investigates the role of information construction in social media platforms and how they shape sustainability perceptions.

The third theme highlights the crucial aspects of effective governance, discussing how transparency in information disclosure can enhance effective governance. Lastly, the fourth theme discusses institutional change resulting from information flows. It examines how the emergence of mechanisms like value-chain traceability in global markets are reshaping governance arraignments, as well as the evolving role of citizens and public engagement initiatives.

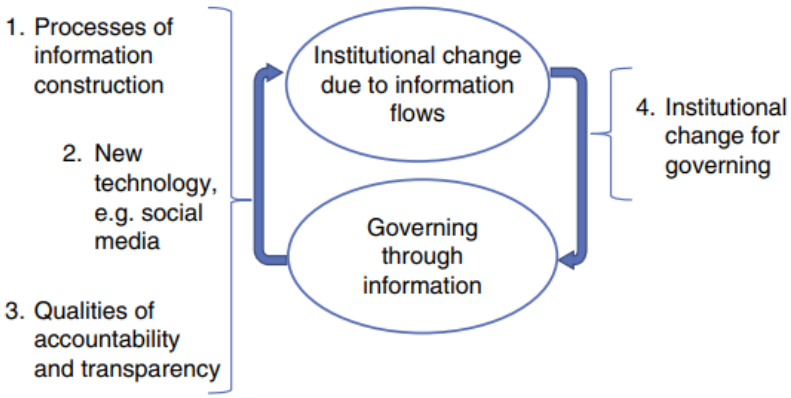

Figure 4: Informational governance framework (Soma et al., 2016)

The implementation of the DPP exemplifies the extensive impact of the informational governance model. The DPP involves the generation, exchange, and management of significant amounts of information throughout the lifecycle of a product as a digital record. The role of governance in this context ensures that this information is effective, accurate, accessible, and securely managed. The DPP acts as a guideline for the requirements companies must adhere to and the critical information considered vital for empowering informed decision-making in consumers. Standardizing the information industry-wide is crucial to ensure consistency as well as comparability.

Understanding the factors influencing reliance on this information will ultimately be critical in assessing the effectiveness of the DPP in promoting a more conscious purchase decision. The EC's proposal for a decentralized data system for the DPP, as outlined in the ESPR proposal, emphasizes the importance of effective informal governance (COM/2022/142C). In a decentralized system, where information is distributed across various stakeholders, governance plays a notable role in maintaining accuracy and trust in the data, potentially through third-party certifications, audits, and reporting standards.

Tienhaara premises the idea that experts and policymakers need disclosed information for effective and efficient governance outcomes (Tienhaara, 2019). However, while acknowledging the need for data to be monitored by competent national authorities, the EU recognizes the concerns related to sensitive commercial data and potential misuse of critical competitive information, which possess a risk to the effectiveness of the DPP (*Interviewee I08*, personal communication, January 2024). Data governance in the fashion industry is expected to complex as it involves dynamic data. This to say that there is a need for greater data governance requirements along with flexible, adaptable to a changing environment, comprehensive and trustworthy mechanisms that ensure data quality (Ducuing & Reich, 2023).

2.3.4 Producer´s dilemma with the DPP: Barriers and challenges

A study has indicated that the majority of brands remain hesitant or unwilling to voluntarily disclose the operational intricacies of their sustainability commitments (Jestratijevic et al., 2022). The transparency associated with the integration of the DPP is expected to expose businesses confidential and sensitive information, regarded as valuable assets. This raises pertinent questions regarding the 'need to know' principle, as safeguarding sensitive information becomes a crucial consideration. Challenges related to data sharing among relevant stakeholders, along with ongoing monitoring and updating of information throughout the entire lifecycle, have been identified as a major challenge for producers. Manufacturers may struggle with identifying and obtaining necessary information, leading to a potential hesitancy in sharing (WBCSD, 2023). While safeguarding intellectual property and confidential information remains a priority for the DPP, producers' unwillingness to disclose such information may pose as a conflict for the envisioned level of transparency. Therefore, establishing a criterion for the information visible to all stakeholders emerges as a central concern. Striking a balance between transparency and safeguarding of sensitive information, enables businesses to position themselves as sustainability leaders while responding to consumers demands for accountability and transparency. The DPP will shed light on every facet of the supply chain, requiring producers to be more diligent in disclosing their practices (Adams, 2023). This might imply the disclosure of unfavourable working conditions, unethical practices, exploitation of resources and high levels of total emissions which damages company's reputations.

Concerning costs, the net benefits associated with DPP integration are inherently tied to the implementation costs for companies. The initial investment to integrate the tool encompasses a series of barriers including infrastructural technological changes, software development as well as employee education and training. Some stakeholders anticipate that this transition will be costly, complex, time-intensive, and prone to error, particularly for small and medium enterprises (SMEs) (Stretton, 2022).

A meticulous assessment of the DPP impact is imperative to ensure a smooth transition and an effective integration (Westerlund, 2023). In the short term this shift will be complex, costly and time consuming, however, in the long term the numerous advantages may outweigh the upfront costs. Enhanced visibility of the entire supply chain may pave the path for targeted strategies for improvement, ultimately optimizing processes. Comprehensive shifts must take place from educating relevant stakeholders on circular practices for instances, to implementing cutting-edge technologies that streamline the transition to a circular economy. Some authors believe that technology such as the blockchain are key enablers, offering a robust foundation for transparent, secure, and accessible product-related information (Rijal & Saranani, 2023) & (Rejeb et al., 2022).

2.3.5 Addressing Greenwashing

Companies face increasing pressures to adopt more sustainable practices and demonstrate accountability. To alleviate and respond to these pressures, some fashion brands resort to greenwashing practices. Becker-Olsen and Potucek defined the greenwashing as “the practice of falsely promoting an organization's environmental efforts or spending more resources to promote the organization as green than are spent to actually engage in environmentally sound practices” (Becker-Olsen & Potucek, 2013). Despite the widespread use of the term ´greenwashing’ remains subject to various interpretations and can be considered a marketing strategy. Approximately 53% of green claims in the EU are based vague misleading or unfounded information (Green Claims, 2024). In an effort to address this issue, the EU proposed a ‘Green Claims Directive’ to help clarify and interpret the term more effectively (COM/2023/166). The directive seeks to establish trustworthy green claims, ensuring accurate and reliable information to protect consumers from deceptive greenwashing practices. Nonetheless, it is important recognize the growth of greener markets with genuinely sustainable companies existing and being adversely affected by these greenwashing practices. To avoid unsubstantiated accusations, a developed classification of the terms is essential.

In the context of the fashion industry, the greenwashing narrative takes various forms. Prominent players in the fast fashion industry such as H&M often employ ‘sustainable or conscious collections’ as a form of greenwashing, while some opt to downcycle materials instead of focusing their efforts on fibre-to-fibre recycling (Asif & Asif, 2020). Despite the shortcomings in transparency, and the potential unsubstantiated claims, these efforts can be viewed as a step in a more positive direction for the fashion industry. They signify that companies are indeed acknowledging and responding to the shifting consumer expectations and growing concerns regarding sustainability. While the effectiveness of these initiatives may vary, this step is a noteworthy development towards a more responsible industry.

The DPP emerges as another significant step in the right direction when it comes to identifying and targeting greenwashing practices. It aims to enable consumers to recognize labels associated with greenwashing strategies and distinguish trustworthy companies in terms of sustainability claims and

green initiatives. The DPP provides consumers immediate access to detect false claims independently while instilling trust that the information on the DPP is legitimate and compliant with EU regulations, as these claims will be checked and verified as per the directives previously mentioned (Protokol, 2024).

Before moving to the next chapter, it is essential to acknowledge the widely studied impact of greenwashing practices on consumer behaviour. Research has shown that greenwashing not only reduces trust in companies but can also negatively impact consumer behaviour (Bosch et al., 2023). The lack of knowledge regarding sustainable fashion leads consumers to become more susceptible to believing false claims. The reluctance to be forthcoming with information and the deceptive sustainability initiatives, makes it difficult for consumers that aren´t educated on the topic to detect these false claims and make informed decisions.

2.4 Consumer Impact

In this research the term sustainable consumption refers to "the use of goods and services that respond to basic needs and bring a better quality of life, while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations (European Parliament, 2020). One of the goals to ensure a smoother transition to a circular economy is to rethink consumption and production patterns in terms of slowing down the continuous extraction of resources. As outlined in the previous chapter, companies are expected to rethink and transform their operations, embracing data-driven, responsible, and transparent supply chains. In this paradigm, consumers must now play an active role, moving beyond passive consumption habits. A series of actions must be taken from the consumer side to help achieve a closed-loop journey, ranging from prolonging product lifespan to embracing end-of-life practices to sustainable procurement. Consequently, policy instruments serve as essential levers in promoting sustainable consumption as they steer industries to comply to certain standards which directly or indirectly impact consumers. The ESPR framework for instance, introduces the DPP, aims to facilitate informed decision-making in consumers, as previously stated. By establishing guidelines and regulations, policy instruments set the stage for concrete approaches to reach these goals while contributing to a more sustainable and responsible consumer landscape. However, a challenge in the DPP implementation will be to empower consumers to actively participate and adhere to this transition. Consumers have grown sceptic and somehow immune to labels, there is a lack of awareness and convenience is a barrier to a circular economy (Morris et al., 2020). Therefore, innovative communication strategies that go beyond conventional marketing methods are necessary to convince consumer to participate in the DPP transition. The digitalization of data can be used to educate and inform consumers enabling more informed sustainable choices but also become co-creator of knowledge themselves (Pocol et al., 2022).

The COVID-19 crisis acting as both positive and negative turning point, compelled a reorganization of the fashion industry to meet new demands arising from the shock and uncertainty of the crisis. A 2020 by McKinsey study revealed that two-thirds of the surveyed consumers considered that since the crisis, it has become even more important to mitigate climate change impacts (Granskog et al., 2020). Furthermore, 57% claimed that they have made significant changes to reduce their environmental footprint in their daily lives. These statistics indicate a notable shift in behaviour, consumers have become more aware, engaged, and concerned with sustainability related topics.

This presents new opportunities for companies to align themselves with these consumer values, accelerate changes in the industry and shift towards more circular models.

A notable trend post-crisis is the increased preference for purchasing second-hand items, especially in younger generations. Gen Z individuals are expected to continue this trend in the future, indicating a clear signal that conscious and responsible consumption is gaining prominence (BCG, 2022). This shift not only influences purchasing behaviour but also presents an opportunity for the fashion industry to rethink its models and align itself with these new consumer preferences. The DPP can be particularly relevant in this context as the entire product journey becomes accessible to consumers as well as their sustainability attributes. Furthermore, another noteworthy trend is the considerable increase in the utilization of online channels (Vladimirova et al., 2023). The crisis significantly accelerated the adoption of online platforms for shopping practices, as it became a convenient distraction from social distancing and the primary means of accessing goods. However, while this shift allowed for contactless transitions, keeping people safer, it brought other challenges, including increased packaging waste, higher transportation-related emissions, and energy consumption.

These evolving patterns in consumer behaviour particularly align with recent EU developments as significant regulatory responses are being discussed. Earlier this year, in March 2023, the EU reached a provisional agreement highlighting not only the importance of the DPP in "enabling consumers to make informed purchasing choices", but also reporting a ban on the destruction of unsold goods, namely, apparel, accessories and footwear (European Parliament, 2023). A few pilot projects are being designed to simulate the user experience of the DPP. Scanning the DPP intends to take the consumer through the journey of products, showing personalized data at one's disposal. Having access to this information at one's fingertips is supposed to make consumers feel empowered to make purchasing decisions. In line with this, a study has shown that increased awareness and education makes consumers more curious about the story behind their clothing products, encouraging user interaction with them (McLaren & Goworek, 2017).

2.4.1 Nudging purchasing decisions: Green Purchasing Intentions

In the dynamic landscape of consumer behavior, understanding the interaction between consumers and the products they purchase is a complex and intricate journey. Fast fashion consumers are often characterized as not entirely rational when it comes making purchasing decisions and are easily influenced by strategic marketing employed by brands (Lu et al., 2022). The tactics of fast fashion brands revolve around resilient supply chains, offering low-cost products, and promoting scarce and seasonal items, stimulating excessive spending and impulsive decision-making (Elverlind & Lien, 2023). Our current consumer culture is characterized by a wasteful production model where companies capitalize on the information asymmetry to deceive consumers and mask their unsustainable practices and the true environmental and social sots of products.

Research suggests that people who feel the need to buy clothing items don´t necessarily consider the risks and consequences of their actions or have environmental concerns (Lu et al., 2022). This downplay of potentially negative consequences coupled with a lack of truthful and coherent information of purchases results in diminished 'perceived risk.' The concept of 'perceived risk' delves into the psychological aspects of consumer behaviour. It suggests that when facing an uncertain situation where a decision must be made, consumers tend to doubt as to what the right decision is. Misleading practices further exacerbates this, by hiding the true implications of products, making

consumer choice based on incomplete and inaccurate information. Essentially, this deception leads consumers to believe they are making green, responsible choices when the reality is quite different.

A study was conducted investigating the impact of consumer perception on greenwashing and its impact on green purchase intention (Lu et al., 2022). Experts have defined green purchasing intention as the "desire or consumers' intention to find a product where organizations follow environmentally friendly manufacturing operations "(Nur et al., 2021). Results showed that consumers perception of greenwashing practices has a direct negative impact on their green purchase intention. In other words, the more consumers perceive and identify greenwashing, the less willing they are to purchase products that employ such deceptive tactics. Moreover, this shift in consumer behaviour underscores the increasing importance of trust in brand relationships. As consumers become more aware and critical of greenwashing practices, they are more likely to choose brands that demonstrate transparency, authenticity, and a true commitment to sustainable practices.

2.4.2 Unpacking the Cognitive Level Theory: Understanding Consumers

The construal level theory (CLT) is consistent with the idea that people mentally construe and represent information/stimuli around them (Liberman et al., 2007). According to this theory, individuals can interpret stimuli at different levels of abstraction, at low or a high level (Van Dam & Van Trijp, 2016). This theory proposes that the different levels of construal can influence people's perceptions, choice of action, reasoning, and social cognition. On one hand, at a low level of construal, people tend to focus on details, specific features of a certain object or event. On the other hand, at a high level of construal, people focus on the broader picture, making the aspects of certain objects or events more abstract.

According to the theory, how we think about certain aspects depends on how far away they are from us in terms of time and social connection. This can be used to explain how people evaluate and choose between various options, looking into factors such as goal persuasion, motivations, social interaction, and perception of their purchases. When something is far away, our mind tends to think about it in abstract, more desirable terms, without considering the practicality aspect. One the other hand, when something is close, we think about it in more practical and concrete terms, but do not consider the desirability aspect of it. "Most consumers claim to consider sustainability issues important" (Van Dam & Van Trijp, 2013)", however, this does not necessarily manifest into sustainable consumer behaviour. Sustainability to consumers is generally described as being a faraway concept, psychologically distant and therefore, more abstract (Jäger & Weber, 2020). Considering that the consumer intends to purchase an item, there are three potential outcomes. The consumer may look at the supply chain information and opt to buy it anyway, they can look at and choose an alternative, presumably more 'sustainable,' or they may opt to not engage with the DPP at all and purchase the item.

Furthermore, the dimensions of psychological distance used to categorize information, such as temporal and social distance, are relevant to understanding how consumers may perceive and possibly respond to the DPP (Trope, 2010). It can be argued that if a consumer feels socially distant meaning that they feel that it does not relate to them or unsure about its benefits, they might be less inclined to adopt/accept the tool. Additionally, how the DPP affects consumer behaviour, social, economic, and environmental aspects could be shaped by the various dimensions of psychological

distance. If a consumer perceives the DPP as being environmentally distant from them, then this tool would have no impact on improving sustainable consumption habits of that individual. However, the attitude-behaviour gap must be considered as it often hinders sustainable consumption (van Dam & Van Trijp, 2016). According to CLT, this gap occurs due to a motivational conflict between the high and low construal levels, which can be addressed by providing extrinsic motivation for sustainable behaviour (Trope, 2010). Therefore, the DPP could serve as an extrinsic motivator among producers and consumers by not only providing verifiable information but also enhancing external regulation. This tool could even enhance consumer intrinsic motivation by providing a sense of competence and autonomy, which are key components of the self-determination theory. By empowering informed choices, producers (companies) and consumers could foster a sense of responsibility and ownership over their own behaviour, leading to more self-regulated and controlled choices and patterns.

2.4.3 Industry Benchmarks- Strategies for Increased Effectiveness

To optimize the impact of the DPP implementation, strategic considerations are crucial. The first strategy to increase the effectiveness of the DPP is cost considerations. The main barriers for consumers to not adopt a more sustainable lifestyle is cost, followed by the lack of product information and a general lack of interest in issues involving sustainability (Cromwell et al., 2023). Taking this into account, while the DPP might help address two of those three issues, the issue of cost is still a challenge. A study has shown that 41% of consumers are not willing to pay more for sustainable items (Zuniga, 2024). However, it is important to note that, few customers understand the true cost, impact and complexities of their purchases, others understand, but choose to look the other way. Therefore, mitigating cost concerns, is crucial in ensuring a smoother transition of the DPP, exploring ways of integrating sustainability into the existing operations without the need for significant infrastructural changes that could significantly escalate costs.

Moreover, consumers claim that either they are unsure of what to trust or exhibit scepticism regarding the influence labels can have on a product's level of sustainability. Therefore, the second strategy involves building a trusting relationship between brands and consumers and avoiding greenwashing strategies. Consumers value transparency, accountability, and environmentally responsible supply chains. To address this issue, the European Commission is considering incorporating an official EU stamp and establishing collaborative partnerships with trusted third-party certification bodies, ensuring authentic, credible, and standardized information, and ultimately building trust among consumers (*Interviewee I08*, personal communication, January 2024). Nonetheless, since this is an industry-wide standard legislation from a trusted body, the reliability of this information is significant.

Educated consumers are more likely to understand and trust environmental information and make more sustainable choice therefore, education and awareness are the third strategy (Al-Nuaimi & Al-Ghamdi, 2022). Investing in consumer awareness of the DPP along with publicizing the benefits it can have, can be pivotal in making this tool known to a broader consumer base. Organizations, government agencies and educational institutions play a crucial role in promoting environmental literacy; understanding DPP information can be a key step in the successful adoption and integration of the tool in daily purchases. Education has even been considered the main contributor and approach to implementing an improved sustainable consumption mindset in the future (Al-Nuaimi & Al-Ghamdi, 2022).

Finally, the last strategy is targeted marketing, a study advocates that sustainable goods should be sold to targeted consumer groups rather than the broad population (Kang et al., 2013). Tailoring strategies and aligning them with preferences enables more effective communication and a sense of connection with consumer values (Torelli & Rodas, 2024). Therefore, segmenting consumers to identify specific groups that are more likely to have an affinity for sustainable products might be an effective strategy. In turn, this encourages more tailored marketing messages and, in the case of the DPP, information that resonates with the values of the consumers in the group.

The sustainable self-concept described by academics can provide insights into how we can better promote sustainable consumption, making it personally rewarding for the individual (van Dam & Fischer, 2015). People may choose sustainable products not only to have a lower impact on the environment somehow, but also to establish and confirm their sustainable identities. The implementation of the DPP may serve to reinforce an individual's sustainable identity, providing detailed information about a product´s sustainability features, allowing for more informed decisions. Providing this transparency aspect will appeal to consumers who prioritize sustainability which will ultimately contribute to the overall competitiveness of textile companies. A sustainable self-concept may influence attitudes towards sustainable consumption which in turn makes individuals more likely to use the tool to make more sustainable choices. Additionally, this concept may influence subjective norms by increasing the perceived importance of sustainable behaviour. Furthermore, the article suggests that the concept of sustainable identity may take sustainable outcomes to a more concrete or low construal level, meaning that engaging in sustainable actions is intrinsically motivated by self-confirmation, offering immediate boosts to self-esteem. This concept does not only apply to consumers but also to organizations with a stronger sustainable self-concept become more likely to make better sustainable choices in their production processes. This can, in turn, appeal more positively to consumers with a strong, sustainable identity.

Chapter 3: Methodology

3.1 Research Design & Participants

The remaining research was conducted through semi-structed interviews with producers inside the fashion industry and an online questionnaire to consumers as outlined in *figure 5*. On the one hand, the interviews were designed to explore the knowledge that a series of different producers within the fashion industry have regarding the DPP. The aims of these interviews were to not only better understand the extent to which producers know and intend to prepare for the implementation but also the impact it might have and the challenges they expect to face. In order to gather respondents to interview, I contacted my network and requested an interview. For the selection process, it was not required for the interviewees to have extensive knowledge of the DPP. A description of the concept, as well as the structure of the interview questions, was sent via email, along with some questions to be discussed during the meeting. This allowed for a more conversational type of interview, as well as an exchange of opinions and perspectives which served to gain a more comprehensive view of the possible future impacts of the DPP.

On the other hand, the online questionnaire focused on the consumer perspective of the DPP. The questionnaire introduced the role of DPP in the fashion industry, explained its intended impact, outlined what it comprises, and detailed the type of information consumers are expected to access.

Additionally, it included questions designed to uncover insights into consumers' awareness, perception, and potential future utilization of the concept.

The primary objective of this questionnaire was to investigate the current state of the DPP in the eyes of consumers, understand its future impact, and gain insights into how consumers might incorporate it into their future buying behaviour. Respondents were segmented into three categories for this study: future DPP users (individuals who intend to utilize the DPP); potential DPP users (those who are likely to adopt it); and unlikely DPP users (individuals unwilling to utilize it in their purchases). The target group for this present research are the future DPP users as well as the potential DPP users, aiming to understand how to persuade those flexible consumers and understand the reasoning behind their doubt. To gather questionnaire participants, personal connections were leveraged and asked to distribute the link within their networks. Moreover, while the DPP is a European Commission tool and will be mainly used within the EU, the inclusion criteria do not exclude those who reside outside this geographical area. The reasoning for this is firstly to capture diverse points of view. Secondly, as the DPP involves considerations related to the fashion industry's supply chains, it is important to recognize its global impact. Sustainability considerations go beyond the EU, including non-EU residents offers a more comprehensive understanding of the challenges and opportunities associated with its implementation.

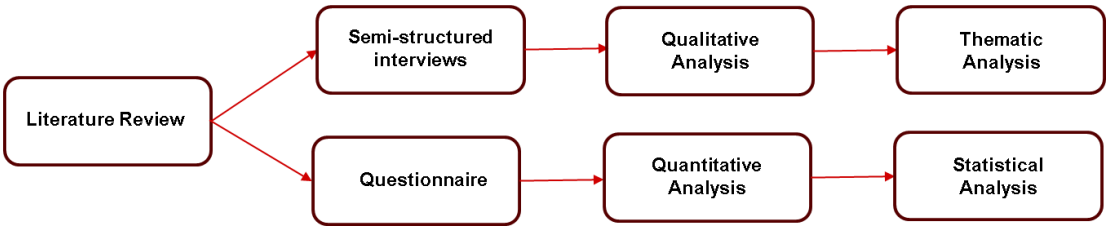

Figure 5: Research Design Framework

3.2 Data Collection and Analysis

This section outlines the data collection methods applied in this research. Primary data collection methods were used via interviews with producers in the industry and an online questionnaire to consumers. The decision to conduct both these methods was driven by the need to gather perspectives and insights from both producers and consumers, providing a well-rounded perspective on the DPP in the context of the fashion industry. Furthermore, secondary research was used to formulate and shape both the interviews and the questionnaire based on pre-existing research. The use of both primary and secondary research enhances the depth of the data collected, contributing to a more nuanced understanding of the impact of the DPP and its reception within the industry and the consumer landscape.

3.2.1 Producer´s Selection- Thematic Analysis

The interviews for this research were conducted using a semi- structure interview (SSI) approach (Adams, 2015). The SSI method is a data collection approach used to obtain in-depth insights aligned with the interviewee's knowledge and perspective of the topic at hand. In this research, the SSI methods was chosen to gather knowledge from professionals within the fashion industry. The selection of the interviewees was deliberate process, involving the identification of relevant producers and suppliers in the fashion industry within my own network. Criteria such as years of experience, expertise, previous and current workplace as well as involvement with sustainable practices were considered during the selection process.

Interviewees have been anonymously categorized as seen in *Table 1*, based on the company the interviewees worked for, the sector and a job description. The interviewees represented global apparel companies (PVH), luxury fashion houses (Karl Lagerfeld) multi-national retail and wholesale corporations (Carrefour), textile companies (Positive Materials), consulting groups (Emendo), academics (Wageningen University & Research) and the automotive industry (Ford). These chosen interviewees present different segments both within the fashion industry and outside, different geographical locations, and diverse roles.

An outline of the planned topics to be discussed was drafted and interview guiding questions were used to keep the interviews focused on the topic at hand. However, the questions were regularly reviewed and refined to ensure they remained relevant and unbiased. Adjustments were made depending on each interviewee and their role in the company. The leading questions were emailed to all interviewees along with information regarding the DPP, in order to prepare the upcoming discussion better and ensure a more focused exploration of the topic. These types of questions are worded as open questions but have a particular focus or direction towards key insights and perspectives related to the DPP as well as any knowledge gaps from the literature review. The intention is to encourage the exploration of certain aspects without offering judgment or opinions from the interviewer's side. Subsequently, interviews were carried out through online video conferencing, starting with a quick introduction into the interviewees background and diving into the questions. Throughout the conversations, notes were taken, to then be transcribed into a narrative, capturing as much detail as possible. At the end of the interviews, a summary of the conversation was provided, to ensure clarity and an understanding of the discussion. This was done to avoid bias or any misunderstandings as well as give the interviewee an overview of the points made and an opportunity to add or explore the responses further.

Table 1: Overview of interviewees.

Interviwee ID Code	Company	Abbreviation	Sector	Job Description
I01	Emendo Consulting Group	EC	Consulting	Partner at Emendo, engaged with customers experience, IT implementations and optimisations. Previous working experience with digital innovation, VF corporation, ECCO shoes and Adidas. Currently working towards the future implementation the DPP, preparating companies for its adoption.
I02	PVH Corp.	PVH	Apparel Retailer	Product developer for Calvin Klein
I03	Karl Lagerfeld	KL	Apparel Retailer	Sample Specialist. Experienced in regional whole-sale seasonal campaign, ready to wear, in all divisions and visual merchandising in stores. Interested in AI based solutions and market intelligence impact on fashion market segments.
I04	Carrefour Group	CG	Retail & Wholesale	Buying manager for textiles. Experience in product development, category management, buying, sourcing and designing. Previous working experience in global multi channel retailers and brands
I05	Positive Materials	PM	Textiles Manufacturing	Director of Business Development leading the expansion of the company's global network, connecting brands with innovative and regenerative textile solutions. And Co-founder and managing partner of Fashion Catalyst, a fashion & apparel consultancy agency. Has previously worked with the integration of the DPP at Fashion Catalyst.
I06	Wageningen University & Research	WUR	Education & Research	Senior Scientist Sustainable Textiles & Biorefinery. Connecting technical skills with design of sustainable value chains for the Circular Economy.
I07	Ford Motor Company	Ford	Automobile Manufacturer	Sustainability Marketing Manager, commited to building to a more sustainable, inclusive and equitable transport future and global communications. Has experience in design, new product development, engineering, customer experience and marketing.
I08	European Commission	EC	N/A	Working within the European Commission on developing the Digital Product Passport.

To analyze the results of the interviews, a thematic analysis was conducted based on the conversations with industry producers. This analysis is a qualitative research method that involves identifying and analysing patterns or themes within a dataset (Naeem et al., 2023). Identifying themes in the interview data involves a close examination of the recurring ideas, concepts, and topics. These themes are overarching patterns that capture the essence of the participants response by systematically sorting and categorizing information. An identification of themes and patterns related to the research questions was carried out to allow for a qualitative analysis of the content and a deeper understanding of the interviews.

A thematic analysis method encompasses six distinct phases. First, the transcripts were familiarized to gain preliminary ideas for codes that can be assigned to describe meaningful concepts from the interviews. This initial phase involves immersing oneself in the data to gather a solid understanding of its content. Active reading is essential in this stage to identify patterns and meanings. The audio-to-text transcription was carefully conducted to maintain and ensure accuracy and its original context.

In the second phase, initial coding was used to form ideas and extracting high-level themes from the transcripts. These codes are meant to pinpoint the data elements and main themes from the transcript. In this phase, the coding was conducted manually, using an open coding system to break down data, conceptualize and categorize it. These codes recurred in the data, laying groundwork for further analysis, overarching themes, and ultimately contributing to more a manageable analysis and comprehensive overview of the research topic at hand.

The third phase involves organizing the data systematically into potential themes. The coded data helps to examine relationships and how codes interconnect and form broader patterns. Visual aids

can be used at this stage to visualize these relationships. Through this systematic organization and consideration of relationships, themes start to become apparent, capturing the essence of the coded data. These themes can then be categorized into main themes, which encapsulate broad concepts, and sub-themes, which represent specific aspects that contribute to the understanding of the main themes.

Emerging themes search, belongs in the fourth phase of the analysis. It generates possible themes that highlight the significance of the data, focusing on recurring topics and observing the ways in which participants conveyed their ideas and reasoning. This approach allows for an in-depth analysis, capturing details with precision and contributing to the overall narrative of the data.

In the fifth stage, a definitive version of the thematic map and the refined themes is presented. The core essence of each theme is established, ensuring clear and concise naming for an effective analysis. The theme names were adjusted ensuring they match the conversations with the experts and tell a story. The final stage is the production of the report, using the themes to give it structure. Drawing from the insights derived from the earlier stages, a report was drafted using quotes from the conversations to address the research questions, explore meanings, assumptions, and implications.

3.2.2 Consumer Selection

Questionnaires are an efficient data collection method providing a way of gathering responses from a large sample. A set of standardized questions were drafted as a means of helping answer the consumer side research questions. This questionnaire was conducted through the analysis software Qualtrics and self-completed by respondents who were invited to voluntarily fill it out and distributed it through a web browser using a hyperlink to facilitate access. Furthermore, the data was captured from mainly closed questions and one open question, where respondents selected their answers from a pre-defined list of options.

The questionnaire was designed to collect information across four categories. Firstly, the socio-demographic information of the respondents was used to establish a context for the analysis. Secondly, exploration questions of consumer awareness of the DPP, aiming to determine the existing knowledge base among the participants. The third aspect focused on identifying the perceived importance consumers give to sustainability-related aspects, including the specific information they desire to find within the DPP. Finally, the fourth aspect involves an analysis of the potential impact of the DPP on decision-making. These questions aimed to capture the preferences through a Likert scale as well as the expectations of consumers regarding the content and details of the DPP. Furthermore, for this study, results were compared to industry benchmarks found within the literature review, stipulated to narrow down constructive insights into the type of consumers, their values, and attitudes.

As previously mentioned, the precise content of information requirements necessary for adopting the DPP remains indeterminate, necessitating additional research. However, while the details to be included in the DPP remain vague, studies have made efforts to conjure up and outline these information requirements. Questions from the questionnaire were drafted based on the conducted literature review. However, question 12 which pertains to the desired information to find within the DPP, drew additional insights from other sources. These include, Ecodesign regulation (ESPR) drafted by the European Commission, Götz et al. (2022), Adisorn et al. (2021) and the expert interviews. Ethical considerations were included in this study even though they most likely will not be part of the

DPP requirements to holistically understand the information consumers value and prioritize. By synthesizing these findings, a compilation of the essential informational requirements is presented in Table *2*, according to the chosen studies and results from the interviews.

The previous chapter stated that the ESPR encompasses requirements such as product durability, reusability, upgradability, and reparability. Along with the presence of harmful substances, carbon and environmental footprint, recycled content and energy and resource efficiency. The expert interviews added additional valuable insights and revealed that, labour conditions, water usage, date and time, certifications, and the product's journey, including its mode of transportation were necessary factors for the DPP information sheet. The studies by Götz et al. (2022) and Adisorn et al. (2021) were chosen since they incorporate the latest developments and offer valuable insights that align with the research. In light of this, the formulation of question 12 considered all these aspects. However, the focus was specifically on the elements that are not only understandable but desirable to consumers. Subsequently, a focus group was surveyed to ensure a clear understanding of all elements.

Table 2: Comparing information requirements in academic literature and expert interviews.

Information Element	European Commission	Götz et al., 2022	Adisorn et al. (2021)	Producer Interviews
Ethical manufacturing practices (underpaid workers, gender pay gap,..)		√	√	√
Supply chain transparency (Details about the product´s journey)	√	√	√	√
Material compostion (including usage of harmful substances)	√	√	√	√
Product durability and longevity	√	√		√
Carbon footprint	√	√	√	√
Energy source/consumption	√	√	√	
Care instructions, reparations and washing information	√	√	√	√
Water usage		√		√
End lifecycle information (redesign, reuse, recycle,..)	√	√	√	√
Product identification	√	√	√	√
Warnings or safety information	√	√		
Unique product identifier other than manufacturer	√			
Detailed technical information				√
Compliance	√	√	√	
Performance	√	√		
Recycled material		√		√
User reviews				√

Chapter 4: Results

The selection of appropriate data analysis methods is crucial to ensure validity and reliability to the interpretation of the collected data for the research. The study employed a triangulation approach, integrating both qualitative and quantitative to comprehensively interpret the findings and address the research questions. A thematic analysis was utilized to explore the producer-related research questions, aiming to understand the impact of adopting of the DPP on supply chain practices and

identifying, through themes as shown in T*able 3*, the key challenges producers in the industry might face. Specific quotes from the experts were used for this analysis, the overview of the interviewees can be found above in *Table 1* and the transcriptions from each interviewee are located below in *appendix 1.2*. Additionally, the consumer-focused questions were tackled through a combination of exploratory and statistical analysis, to gather insights on how consumers might perceive and utilize the tool and the strategies can be employed to enhance effectiveness. Moreover, both these methodologies were supported by the insights gathered from the literature review. These research outcomes aim to provide a more nuanced and well-substantiated analysis.

4.1 Producer Interviews: Thematic Analysis

Table 3: Thematic analysis theme overview.

Themes	Sub-themes
DPP Implementation Challenges	Established processes
	Corporate readiness
Operational Efficiency and Supply Chain Adaptation	Supply chain optimization
	Treaceability and technology integration
Transparency & Sustainability Goals	Environmental considerations
Consumer Engagement and Impact	Consumer Adoption and Behavior
	Expectations

Addressing the first theme, which focuses on the **DPP Implementation Challenges**, interviewees have highlighted that the DPP will be a game changer for the industry but have also acknowledged existing concerns with its adoption within companies.

“Implementing a DPP in garments by 2030 will be a significant challenge due to the complexity of the vast supply chain." – I04

As stated by interviewees information especially from less developed countries like China and India will be a challenge (*Interviewee I04 & I07*, personal communication, January 2024). The consensus among experts is that the fashion sector, with its complex and intricate supply chain network, faces a significant operational challenge in transitioning to a digitalized, blockchain-driven approach by the targeted year of 2030. The complexity and magnitude of supply chains leads to a lack awareness regarding their true dimension and intricacies. Stakeholders pointed out that supply chain operate within an elaborate network of entities such manufacturers, suppliers, which can contribute to the resistance and hesitancy in digitalizing supply chains. The human tendency to resist change, coupled with a longstanding and accustomed familiarity with established practices, can instigate a reluctance to embrace change and ensure a smooth transition. Furthermore, experts raised concerns regarding the communication and collaboration across the network. The fashion sector involves numerous entities, as previously mentioned, each playing a crucial role in the supply chain. The challenge lies in coordinating these interconnected entities which often operate independently or in specific niches of the chain, to adopt and integrate the DPP.

“There are major technological barriers with the integration of the DPP into the existing systems.” - I01

Each entity has their own established processes, technologies, and communication methods, making a standardized and uniform digital solution, a challenge. Resource constraints were also identified, as integrating modern technologies requires substantial investments. Upgrading existing, system especially in the presence of capacity constraints, can prove to be both a financial burden and a logistical challenge. In terms of corporate readiness, experts view the adoption of the DPP as inevitable for companies operating in the industry. This urgency lies in the fact that the sooner they embrace this change, the better positioned they will be to navigate not only the complexities but also the opportunities the DPP presents.

“Convincing companies to start preparing for the DPP implementation. It is inevitable, and the sooner companies see it, the better." - I01

Furthermore, an interviewee retrieving raises a critical concern about companies potentially adhering to the basic compliance standards of the DPP without taking the extra step (*Interviewee I01*, personal communication, January 2024). This implies that companies might only be willing to fulfil the minimum requirements and not recognize it as both a leverage point and as a transformative tool for enhancing transparency, sustainability, and operational efficiency throughout the supply chain. Consequently, the European Commission believes that the ultimate challenge will be accurately implementing the Ecodesign requirements. Stating that this will have significant costs for companies as they will not only need to obtain access to the information that is required but also meet the performance requirement minimum established by the EC. Highlighting the need for an early preparation for this impactful change, but also recognizing the importance of allowing for a transition period.

“Implementing the exact Ecodesign requirements poses as the ultimate challenge”- I08

The second theme, **Operational Efficiency,** is underscored by various interviewees who emphasized the potential transformative operational benefits of the DPP. The thematic analysis revealed that interviewees believe we will see increased efficiency, focusing on streamlining processes as well as enhancing supply chain management.

“The DPP has a huge positive impact on the supply chain. We will be able to follow product in a much more efficient manner.” – I07

However, experts stated that regardless of these advantages and improved efficiency, managing vast amounts of data will be a considerable challenge. A network of information exchange across the supply chain requires significant efforts. Companies will not exactly need to know their entire supply chains, but key points are essential depending on the requirements that will be introduced.

Another common topic amongst interviewees was the emphasis on end-to-end visibility in the supply chain. They believe that a comprehensive overview of products entire journey will be a game changer, enabling companies to identify weaknesses and areas for improvement. Furthermore, an expert anticipated that digitalizing information would reduce manual efforts such as labelling clothing items and documentation, minimizing risks and enhancing quality control (*Interviewee I0*, personal communication, January 2024). This in turn, can potentially optimize supply chains, spanning from production to distribution. Additionally, this shift from static, paper-based records to digital data allows for access to real-time information, enabling more informed decision-making, reducing the likelihood of errors, quicker response times and a more agile and responsive chain.

"From an operational point of view, I see a huge advantage in having a QR code as it will make paper labels outdated. We struggle a lot with the paper labels, and they get lost, and it complicates the entire process, leaving us without the ability to trace it. The DPP will bring 100% product identification" – I03

In the realm of traceability and technology integration, the concept of blockchain emerged as a significant topic of discussion. An interviewee considered the blockchain as a disruptive force but also a matter of concern (*Interviewee I03*, personal communication, January 2024). The possibility of implanting dual blockchains was mentioned, one for supply and another for consumers.

"I'd also see more technology and blockchain, the more the better." – I05

I believe the blockchain disrupts everything it touches. – I03

In terms of **Transparency and Sustainability Goals**, the third theme, experts suggested that achieving transparency without exposing and exchanging sensitive data is a delicate matter. Interviewees expect potential resistance from companies' and highlights the need to protect companies' confidentiality and business interests. Producers in the fashion industry are aware that striking the right balance is crucial to maintaining consumer trust. However, this approach raises concerns as in terms of business operations, the potential exposure of sensitive information due to the inherent transparency of the blockchain technology, may lead to some apprehension. It may damage businesses reputation and the revelation of proprietary secrets and business strategies.

"… major issue for businesses as 100% transparency means secrets will be exposed." – I03

Furthermore, interviewees shared insights on how the DPP implementation intersects with environmental considerations and sustainability objectives. An interviewee shared that companies are implementing strategies such as the reallocation of supply chain to local spots, in a process called nearshoring (*Interviewee I01*, personal communication, January 2024). This involves making smaller but more frequent shipments, ultimately decreasing transportation costs, and reducing the environmental footprint. They anticipate that the DPP will include considerations such as the carbon footprint of products, wastewater, PFAS, material composition and end-of-life information. Experts also view the DPP as a platform that could facilitate adherence to environmental regulations and sustainability standards but recognize that it will be challenging for the fast fashion industry as the distinctive low prices often conflict with circular and sustainable goals.

The final cross-cutting theme is **Consumer Engagement and Impact**. Experts believe that the consumer adoption of the DPP could be influenced by factors such as generation and environmental consciousness. An expert stated that he sees a greater impact in the usage of the DPP in the younger generations and believes that there are now more younger people concerned with environmental issues (*Interviewee I01*, personal communication, January 2024). It was argued among interviewees that the DPP should be a positive tool for consumers who want to make informed purchasing decisions with a clear conscious.

"The DPP could become a tool to educate people, make them see the true impact of this harmful industry, and persuade them to choose fewer damaging options." – I05

The DPP is positioned has a tool with the potential to meet consumer expectations, however understanding the type of consumers and what requirements they expect and desire to see could lead to a more receptive adoption of the tool. A major advantage of the DPP is that anyone can access this information. Experts, as consumers themselves, would like to see the information previously stated as well as, the complete journey of products, transportation details, ethical

considerations, chemical usage, treatment and washing options, timeline information, user reviews, detailed technical information, explanation of sustainable practices, and how to extend the products lifespan. Furthermore, an interviewee stated that while this information is crucial understanding the context becomes even more significant (*Interviewee I05*, personal communication, January 2024).

"… explanations as to what regenerative cotton is for instance, and why is it better than other options or comparative information, to be able to compare the product I want to buy with others. This to say that information should have context." – I05

Consumer acceptance was stated by interviewee *I01* as a critical success factor of the DPP, anticipating a positive reception particularly among environmentally conscious consumers. Finally, an interviewee[1] highlights the importance of educating consumers in environmental and social matters, influencing their purchasing decisions, and contributing to an overall reduction in consumer waste. A prominent concern among experts and literature revolves around the role of consumers in the successful implementation of the DPP. This innovative tool addresses a critical issue - the loss of information. Experts have identified that once a product is purchased, critical information regarding aspects such as material composition and maintenance instructions is lost once consumers cut the tags.

4.2 Comprehensive Consumer Questionnaire

The results from Qualtrics were downloaded into an Excel spreadsheet, a codebook was created for each question in the form of a pivot table, and the data was sorted and thoroughly examined for errors and missing values. This ensures that all respondents completed the entire survey and agreed with the permission statement to use and analyze the data for research purposes. A descriptive research methodology approach was used to identify and describe consumers future utilization and recognition of the DPP, using their attitudes and opinions.

4.2.1 Demographics trends

The total survey sample was comprised of 145 respondents; however, after filtering out anomalies and cleaning the data, the final sample that was used for analysis included 120 respondents. Notably, participants residing in non-EU countries were not excluded from the sample, despite the DPP being intended for use within the EU, their insights are valuable to the research. Furthermore, a margin of error was calculated with a 95% confidence level for the entire EU population to indicate the quality and reliability of the questionnaire results. A margin of error of 9% implies a degree of uncertainty therefore, caution must be taken when making precise predictions about the population.

$$\text{Margin of error} = z \times \frac{\sigma}{\sqrt{n}}$$

z= confidence interval
σ = population standard deviation
n= sample size

Examining the demographics of the respondents, which can be found in the *appendix table 9*, the majority are residents of Portugal (57%), followed by the Netherlands (20%). Gender distribution

[1] Interviewee I05

indicates that more than half the sample is female (62%) while the rest are male (38%). Furthermore, the age distribution reveals a concentration in the 19 to 28 age group, constituting 43% of the overall participant, followed by the age group of 49 to 58 representing 27%. In terms of the level of education, 43% of the participants hold a master's degree as the highest level of education, while 39% possess a bachelor's degree.

4.2.2 Exploratory and Statistical Data Analysis

The questionnaire questions were segmented into three key categories, DPP awareness and understanding, perceived importance and preferences and the potential impact of the DPP on decision making. Exploratory Data Analysis (EDA) was employed as it serves as a critical phase in the research providing a foundational understanding of the data and uncovering meaningful insights that shape the analysis. Furthermore, it emphasizes the use of visual displays of data such as graphs and charts to explore and understand results (Saunders et al., 2019). This methodology was used to gain overall insights into the answers provided by respondents.

Furthermore, descriptive statistics was utilized to compliment the insights gained from the EDA. Descriptive statistics deals with numerical summary, description, and analysis of data values (Saunders et al., 2019). It is a tool to better understand and communicate key features for a set of data. For the purpose of this research, the mean, also known as average, was used as central tendency measure. Furthermore, standard deviation calculations were interpreted to describe and compare the extent to which values differ from the mean. On one hand, a low standard deviation suggests that values in the dataset tend to be close to the mean, this can be seen as a measure of consistency or precision in the data. On the other hand, a higher value indicates that values are more spread out from the mean, suggesting a greater diversity among the data points. This statistical analysis methodology was applied to further analyze the key categories from the questionnaire, mainly focusing on the perceived importance and impact on decision making questions. The awareness and understanding category were deliberately excluded from the analysis, as these inquiries primarily serve the purpose of determining the existing familiarity and awareness among consumers as well as offer insights into the current landscape of the DPP. This is, therefore, not subject to statistical interpretation, along with question 12 regarding the DPP requirements, which does not require descriptive analysis either.

$$\text{Mean} = \sum \frac{Likert\ scale\ x\ Count\ of\ respondents}{Total\ respondents}$$

Throughout the questionnaire, participants were presented with statements designed to scope their attitudes, perceptions, and future intentions. These statements were then categorized on a Likert scale, a tool that measures the degrees of agreement or likelihood. To facilitate quantitative analysis, each category within the Likert scale was assigned a corresponding numeric value, with 5 being the highest level of agreement or likelihood and 1 being the lowest. However, it is important to note that not all questions possess this standard Likert scale and cannot, therefore, be compared to each other.

DPP Awareness and Understanding

Relating to the familiarity of the DPP (question 7), more than half of the respondents (54%) indicated they had no previous knowledge of the concept, however, 46% demonstrated familiarity with the concept. The contrast between those acquainted with the concept and those that aren't emphasizes the need for targeted communication strategies and to bridge the knowledge gap, ensuring that even before the DPP is integrated, people become more aware of its functionalities and usefulness.

Furthermore, it was significant to understand whether participants were indeed accustomed to scanning QR codes as it provides a baseline understanding of the familiarity with this type of technology. Based on the results from question 6, 73% of the sample are indeed familiar with its usage, while 20% are somewhat familiar. This information can help tailor communication strategies, as it assesses whether respondents are comfortable with its usage, provides predictive insights into the likelihood of acceptance of the technology and helps segment the market. In addition to this, in question 10, 49% of consumers recall instances where they felt mislead by certain labels on their clothing products, indicating a certain level of awareness to false information, while 30% simply somewhat recall feeling mislead.

Perceived Importance

Questions 9: How important is it for you to make sustainable choices when purchasing clothing products?

Diving into consumer behaviour, question 9 revealed that 38% of the respondents expressed that to them, making sustainable choices is moderately important, followed by 32% that considered it particularly important. The average responses of the Likert scale in terms of the respondent's importance to making sustainable choices were calculated. The Likert scale ranged from 'extremely important' to 'not at all important' where the higher numeric value (5) indicated a higher perceived importance and the lower (1), least importance. The calculated means of approximately 3.38 suggests that on average, respondents are placing their answers between 'slightly important' and 'moderately important,' indicating a moderate level of perceived importance. Furthermore, the mode is the value that appears most frequently in the dataset which would be the highest count, 46 which is value 3 on the Likert scale, 'moderately important' as well.

The standard deviation was then calculated to measure the amount of variation or dispersion in the set of values. Results from the calculations showed a standard deviation of approximately 0.22 which indicates a relatively low level of variability in the respondent's opinions. This to say, that the value supports the interpretation that there is a consistent moderate level of perceived importance attached to making sustainable purchasing choices.

Summary of results*:* Participants consistently place a moderate level of importance on making sustainable choices, with a notable portion expressing a higher degree of importance.

Question 12: What information would you like to see present on the Digital Product Passport that would impact your purchasing decisions?

Regarding the desired information requirements, the results from question 12 provided insights into the respondent's preferences and the valued priorities. Unlike the other questions, which had a clear

numeric order allowing for descriptive statistics calculations, question 12 is structured as a multiple-choice format to uncover patterns and insights within the information requirements. Therefore, a more focused exploratory data analysis was conducted, providing valuable insights into the preferences and priorities of the respondents regarding the information they desire to see in the DPP, as can be seen in Figure 6. The majority of respondents (81%) prioritize the material composition of their products, emphasizing the significance consumers place on sustainable and eco-friendly materials in their clothing items. Ethical manufacturing practices was the second highest requirement selected among participants with 80%. This emphasis suggests a growing awareness of the fashion industry's issues and demand for products that are manufactured under ethical and socially responsible standards. Care instructions, reparations and washing information were also ranked high on consumers' priorities; 66% are interested in understanding how to maintain and extend the lifespan of their products.

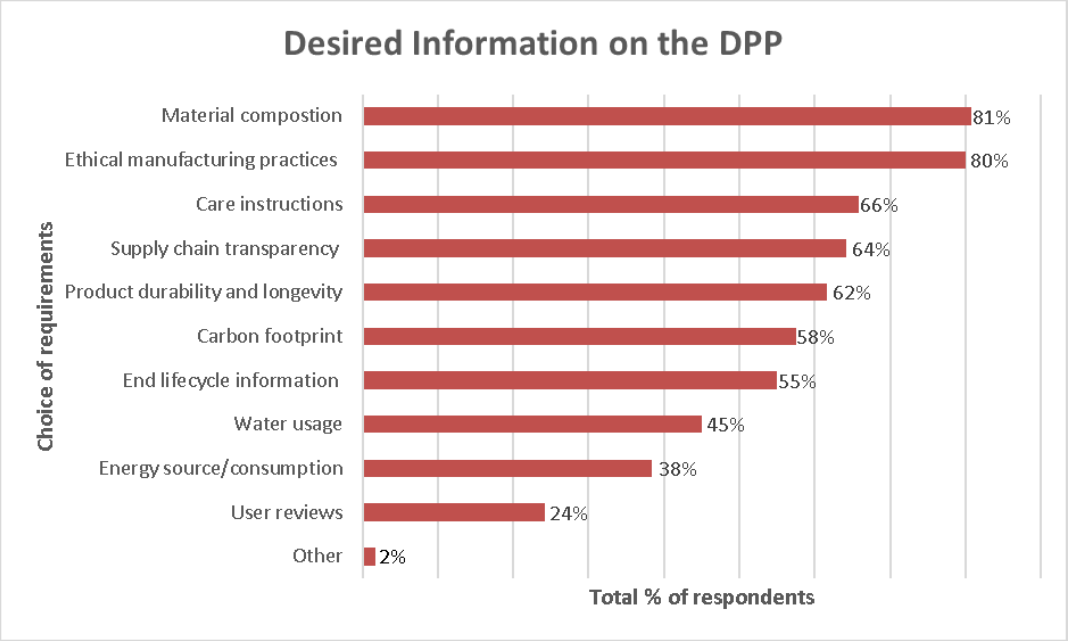

Figure 6: Respondents selection on the desired information requirements of the DPP

Question 13: Are you interested in certification marks of your clothing products in the Digital Product Passport (ethical, fair trade, eco-friendly)?

Results also showed that the majority of respondents, 78%, are interested in certification marks on the DPP while 18% are neutral, expressing a positive inclination. This underscores a consumer demand and eagerness to make more informed and sustainable choices, seeking assurance through recognized certification marks and valuing transparency and authenticity in their purchases.

Impact on decision-making

Question 11: State whether you agree or disagree with the following statement: "Having access to a Digital Product Passport would positively impact my ability to make sustainable choices when purchasing clothing products".

Approaching question 11 regarding the possible impact of the DPP, 58% of respondents agree that indeed having access to a DPP would positively impact the ability to make sustainable choices. The majority agreed with the statement and 33% strongly agreed which is quite positive.

Using descriptive statistics, the same methodology was applied to all the questions that fall under the impact on decision-making. The DPP positive impact statement, ranging from 'strongly agree' (5) to 'strongly disagree' (1) was coded in the Likert scale and the mean as well as the standard deviation were calculated. Results show a mean value of approximately 4.21, indicating that the average answer lies in the 'agree' statement (4). Therefore, respondents agree that having access to the DPP would positively impact their ability to make sustainable choices. Moreover, the standard deviation of 0.71 means the responses regarding the positive impact of the DPP are clustered around the mean. In other words, the spread of responses is relatively consistent, with less variability in opinions.

Summary of results: *Participants generally agree that having access to the DPP would positively impact their ability to make sustainable choice.*

Question 14: Say, the Digital Product Passport you scanned has all the information you are looking for, if you come to the conclusion that maybe that product or brand you like does not meet your criteria, what would your next step be?

Furthermore, in question 14, a hypothetical scenario where respondents faced an uncertain situation when the information on the DPP did not meet the consumer's ideal criteria, 70% would deviate from buying the product but would still buy from the brand. While 22% would choose not to buy from the brand entirely. The mean value for this question of 2.16, suggests that on average, respondents lean more towards the option of "Not to buy from this brand entirely." Furthermore, the standard deviation of 0.52 indicates that responses were moderately consistent around the mean. While there is some degree of variability, most prefer not to buy from the brand entirely.

Summary of results*: On average, respondents would deviate from buying that specific product but would still buy from the brand if the DPP information did not meet their ideal criteria.*

Question 15: From the list below, which best describes your future utilization of the Digital Product Passport concept?

Lastly, looking ahead into the future utilization of the DPP, consumers in question 15 seemed to be leaning towards the likely use of the passport with 49% answers, followed but a possible usage for some product but not every single one with 35%. This question was analysed, this time using a forced Likert scale ranging from 1-4, as a means to compel respondents to select a response this facilitates the analysis, reduces ambiguity, and more meaningful conclusions can be drawn. On average, respondents express a moderate inclination toward utilizing the DPP in the future. The results demonstrated that the mean of 2.77 falls between 'Might use it for some but not for every single one' (3) and 'I will likely use it' (2). The standard deviation, similarly, to the average suggests a moderate level of agreement with a value of 0.72, indicating a more consistent pattern of opinions.

Summary of results: Respondents exhibit a moderate inclination towards the future utilization of the DPP.

Table 4: Overview of descriptive statistics analysis.

Variable	Mean	Standard Deviation
Q9: Sustainability Importance	3.38	0.22
Q11: DPP impact	4.21	0.71
Q14: Hypotetical Scenario	2.16	0.52
Q15: Future Utilization	2.77	0.72

Finally, the participants of the study had the opportunity to leave comments or suggestions at the end of the survey. Overall, respondents expressed a combination of enthusiasm followed by expectations but also some concerns. Consumers see the potential of the DPP, allowing them to make more informed decisions, helping combat greenwashing, increasing accountability and providing insights into the company´s manufacturing practices, particularly child exploitation. The comments also showed that consumers are ever more willing to seek alternatives in second-hand platforms if they find that the information is lacking and show a willingness to pay more for sustainably fabricated clothing. Additionally, in order to ensure more trust, credibility and acceptance, the recommended adherence to international standards such as ISO, language accessibility and the inclusion of benchmarks for price comparison. Highlighting the importance of keeping the information simple, clear, and accessible to all. In terms of the more negative feedback, consumers showed scepticism towards the actual impact of the tool. Respondents expressed concerns about the potential information overload that consumers might face during the purchasing process and doubt the integrity of the DPP stating that it is a “waste of time” and a source of “half-truths.” Some respondents even proved to be sceptical about the regulatory influence of the EC, perceiving the DPP as bureaucratic.

4.2.3 Target Group Analysis with Industry Benchmarks

For the purpose of this study, the population was segmented into three groups based on the respondent's answers to question 15 regarding future utilization. These group include future DPP users, potential DPP users and unlikely DPP users to prevent a one-size fits all approach. The future DPP users were the respondents that selected the following statements on the questionnaire; ‘I will definitely use it for every purchase’ and ‘I will likely use it.’ As previously mentioned, the target group for this research are the potential DPP users. To identify this target group, the respondents who indicated they “might use it for some but not all products” were filtered out of the data as they represent some level of interest but with certain limitations. The unlikely DPP users selected the ‘I don’t see a reason for using this’ option statement. A cross tabulation analysis was employed to delve into the population aiming for a more detailed examination and a holistic understanding of the different consumer groups.

The consumer impact research questions were split in two sub-research questions (SRQ) for a more in-depth analysis. To address the following question: *How will consumers perceive and utilize the digital product passport when making purchasing decisions for fashion products? (SRQ2)* An analysis into future DPP users was leveraged to extract specific actionable insights and explore the perceptions and behaviours of this target group. Insights gained from the analysis have the potential

to guide the development of the DPP that resonates with the needs and preferences of a group that is more likely to adopt this tool.

In terms of the second consumer impact research question: *What strategies can be employed to enhance the effectiveness of this tool in promoting sustainable consumption behaviour*? (SRQ3) A different approach was used since this question is more focused on strategies to enhance effectiveness. The target group, potential DPP users, offer actionable, practical, and direct recommendations that can inform an improved design of the DPP.

Future DPP Users and their desired information requirements

To address and understand how consumers might perceive and utilize the DPP, an in-depth analysis into the future users was conducted. Future users have a higher likelihood of accepting and adopting the DPP in their purchasing decisions. They are also more likely to provide informed responses based on their values and preferences on what might lead them to better engage and utilize the tool. These results lead to a more nuanced understanding of the context and conditions in which future users plan to use the DPP; strategies can then be devised to encourage its adoption and utilization in the long term. Question 11 from the questionnaire was used to directly assess the perceived impact of the DPP on sustainable choices. The answers provided by the respondent's insights into how future users envision the role and integration of this tool in their decision-making processes. A cross tabulation was conducted to understand the responses of the future users in question 11 as seen below in Table 5.

Table 5: Cross tabulation between future DPP users and the positive impact statement in question 11 of the questionnaire.

"Having access to DPP positively impact my ability to make sustainable choices"	Future DPP Users	
	Count	Percentages
Strongly agree	34	45%
Agree	39	51%
Neutral	3	4%
Disagree	0	0%
Strongly disagree	0	0%
Total	**76**	**100%**

Results showed that more than half (51%) of respondents from this group 'agree' with the fact that having access to the DPP positively impacts their ability to make sustainable choices. Followed by 45% that 'strongly agree' with the statement. This signals a strong alignment between the perceived impact of the DPP and the sustainability considerations of future DPP users.

Regarding the potential future utilization of this group, the information deemed crucial by respondents provides valuable input on the requirements consumers desire to see on the DPP that in turn impact their decision-making process. As seen below in Table 6, respondents consider material composition information, including the usage of harmful substances, ethical manufacturing practices and care instructions to be priorities in the passport. These requirements must be present in the DPP to meet the specific needs and priorities of consumers who are most likely to embrace this tool.

Potential DPP Users and Industry Benchmarks Analysis

To better understand the characteristics of the segmented population, a benchmark analysis was conducted leveraging insights from the literature review in chapter 2. Selected parameters for comparison based on the literature included the level of respondent's **education**, their **sustainability awareness**, and their perception of **greenwashing** practices. The cost consideration benchmark was excluded from the analysis as it is uncertain whether the DPP will directly impact the cost aspect of consumer purchases. The rationale behind employing this methodology lies with the aim of uncovering distinctive characteristics of the target group. As stated in chapter 2, education, has been identified in the literature review as a key determinant in impacting sustainable behaviour. Studies have indicated that a higher level of education correlates with increased environmental awareness and likelihood to engage in sustainable practices. Incorporating this analysis contributes to understanding the educational background of potential DPP users may contribute to or hinder the successful integration of the DPP.

Furthermore, a sustainability awareness analysis plays a pivotal role in acknowledging consumers' increased importance of sustainable choices. Literature underscores the role of awareness in influencing environmentally conscious behaviour, highlighting the need for consumers to be well-informed regarding sustainability issues. Lastly, the inclusion of the perception of greenwashing practices stems from the literature's emphasis on trust and transparency in consumer-brand relationships. Examining this aspect allows for an exploration of the scepticism and trust factors among potential DPP users, enabling the development of tailored communication strategies. This approach seeks to understand the distinguishing features of the segmented groups, mainly focusing on understanding the potential users. The overarching objective of this analysis is to delve into the intricacies of this specific user group, uncovering reasons for their hesitation, delineating their values, and evaluating the levels of education and awareness.

Moreover, while the total sample of respondents comprises 120 responses, when filtering the target group, the sample for analysis comprised 42 respondents, the future DPP users were a total of 76 and the unlikely users represented 2 respondents, making it challenging to draw conclusions. It is also relevant to mention that from this target group, 52% hold a master's degree or higher, half (50%) of the respondents are between 19 to 28 years old and 48% were aware of the concept.

Education

Potential DPP users show a varied distribution with 33% holding a bachelor's degree and 52% possessing a master's degree or higher, as seen in *Table 5,* indicating an educated demographic. The target group in question, potential users, showcase a high prevalence of individuals with advanced degrees. Recognizing the potential influence of education on the likelihood of adopting the DPP is essential for crafting targeted interventions that resonate with the targeted group educational background or a shift in the educational programs. In other words, potential DPP users are educated consumers who doubt the tool's effectiveness and future usage. Further research is, however, needed to interpret these findings with caution as there is no clear indication that having access to a higher education translates to increased sustainability consciousness or a greater willingness to adopt the DPP.

Table 6: Cross tabulation between the potential DPP users and their level of education.

Level of Education	Potential DPP Users	
	Count	Percentages
Master´s degree or higher	22	52%
Bachelor´s degree	14	33%
High school degree or equivalent	6	14%
Total	**42**	**100%**

Sustainability Importance

The majority of potential DPP users (55%) view sustainability and sustainable choices as moderately important, as illustrated *in Table 6.* Understanding these varying degrees of importance within the target group is essential for developing effective communication strategies that elevate these figures, encouraging heightened interest among consumers in sustainability-related matters. Results from this analysis align with the findings from the literature review, as the importance consumers give to sustainability attributes influences consumer behavior. Notably, the more neutral answers including moderately and slightly important, collectively represent the majority of answers. It is also noteworthy to mention that a limited number of respondents (2%), strongly prioritize sustainability practices, showcasing a specific subset within this group that highly values sustainability.

This particular target group tends to lean more towards moderate importance of sustainability in their purchases. In other words, these results suggest that the consumers that are hesitant to adopt the DPP, view sustainability simply as moderately important. This underscores the intricate interplay between the likelihood of DPP adoption and sustainability attributes. It shows that one of the reasons these hesitant consumers aren't future users is due to the lack of importance they attribute to sustainability in their purchases. The need to understand these consumers, identify gaps and strategies for improvement, and ultimately aim for a potential transition to future users becomes crucial when thinking about strategic ways to enhance the effectiveness.

Table 7: Cross tabulation between the potential DPP users and their attributed sustainability importance.

Sustainability Importance	Potential DPP Users	
	Count	Percentages
Extremely important	1	2%
Very important	6	14%
Moderately important	23	55%
Slightly important	11	26%
Not at all important	1	2%
Total	**42**	**100%**

Greenwashing Awareness

Across potential users, there is a significant percentage of respondents who are aware of greenwashing practices as can be seen in *Table 7*, but also a notable percentage that is somewhat or

not at all aware. While 43% are aware of greenwashing practices, more than half of respondents are somewhat or not at all aware of this issue. This suggests potential gaps in information and the urgent need to inform consumers of these misleading and harmful practices that are influencing purchases and taking away consumers ability to make informed decisions. Greenwashing awareness is a prevalent topic, but it is clearly not yet universal, consumers need to be educated on the role of greenwashing practices in their purchases in order to be able to identify and combat and prevent themselves from being influenced by it.

Table 8: Cross tabulation between the potential DPP users and their greenwashing awareness.

Greenwashing Awareness	Potential DPP Users	
	Count	Percentages
Yes	18	43%
Somewhat	14	33%
No	10	24%
Total	**42**	**100%**

Even though the total sample of future DPP users is higher than the potential users and the percentage of people that are unlikely to use it, is relatively small, results showed a clear degree of uncertainty and hesitation among potential users as 42 respondents out of 120 are hesitant. This should not be seen as a barrier to the implementation of the DPP, but as an opportunity to understand these consumers, what drives their decisions, why they are hesitant and use that to improve the tool before its release into the market.

4.3 Reliability and Credibility

Several considerations were meticulously integrated into the research process for both the semi-structured interviews and the questionnaire. The expert interviews primarily involved stakeholders from the textile manufacturing sector, potentially limiting the diversity of perspectives. Future research could include a more diverse range of experts, such as consumers, environmental activists, researchers, and retailers, to provide more comprehensive perspectives and understanding of the challenges and opportunities the DPP faces in the industry. Recognizing the sensitivity of the information shared, the identify and perspectives of the interviewees, anonymity was prioritized. This approach ensures integrity is upheld throughout the research as well as the ethical treatment of information and its participants.

The questionnaire methodology was designed with reliability in mind. To ensure uniform understanding into the DPP concept, a clear definition, a summary of the purpose of the study and explanatory notes were provided before the start of the questionnaire. These steps were taken to promote consistency and a levelled understanding of the gathered data. Moreover, a mixed-method approach of closed-ended and open-ended questions were formulated to allow for the collection of both quantitative and qualitative data, this way, enriching the research. To maximize the response rate, other considerations were taken into account such as the length of the questionnaire, an emphasis on confidentiality, the use of user-friendly language, coupled with a visually appealing

format, to improve respondent's engagement, experience with the questions, and facilitate understanding. In terms of the quality of the data, it was properly sorted and checked for errors and incomplete data using the Excel software system. Collectively, these measures aim to improve the reliability of the data and foster a conducive questionnaire environment.

Chapter 5: Discussion

5.1 Producer Influence and Challenges in the DPP implementation

The perspectives of experts in the industry and existing literature were pivotal in gaining insights into the challenges associated with the DPP implementation. On one hand, the input from industry professionals shed light on the multifaceted landscape that surrounds the integration of the DPP. In engaging discussions, these experts provided valuable perspectives on the potential impact, challenges, and transformative dynamics introduced to the intricate processes of the industry's supply chains. On the other hand, existing literature complemented these insights by providing a framework for understanding the industry's broader challenges.

5.1.1 Global Supply Chain Dynamics

The analysis underscored the widespread recognition of several challenges associated with the implementation of the DPP into existing systems. While acknowledging the positive impact on supply chains and the anticipated shift towards digitalized practices, industry experts' express concerns regarding the technological barriers and the potential general reluctance to share data. The fashion industry operates within complex technological networks and the incorporation of the DPP may lead to substantial adjustments and investments in information systems, existing structures, data infrastructure and communication channels. Addressing the research question regarding the challenges producers are expected to encounter during the implementation of the DPP, an analysis of the intricacies of supply chain adaptation is essential.

Producers in the industry traditionally rely on established operational systems, making them prone to resistance when confronted with sophisticated requirements and transformative changes accompanying the adoption of the DPP. Therefore, experts bring attention to the issue of resistance from producers and even governments, recommending careful consideration when introducing these technologies, especially in a sector where practices are deeply ingrained. Experts suggested a phased approach to ensure a smoother, more effective integration, producers need to truly grasp the impact of the DPP and the infrastructural changes it requires, and early preparation is key.

Supply chain adaptation emerges as a common challenge amongst interviewees, emphasizing the complexities of these processes. The logistical and manufacturing process of the textiles supply chain is geographically dispersed. There is a wide variety of actors involved in the creation process of a single item of clothing. Garments go through a long series of processes from mechanical to chemical which aren´t yet digitally controlled. And SMEs, but also medium-sized enterprises are not in control of their entire supply chain. Therefore, implementing data points with the requirements that

companies need to comply with and be aware of to exchange that information, ensuring interoperability, poses a hurdle. This will have significant costs as companies will not only need to get the information that is required but also meet the established performance requirement minimums. Carrying this out, to ensure compliance with these requirements, will have a direct impact on supply chains as companies will need to ensure that their products comply with the upcoming requirements, change production lines, suppliers that do not comply with the requirements, invest in new machinery, introduce internal compliance policies and third-party auditors. This underscores the difficulty in transitioning existing structures to accommodate a new tool and its requirements. However, the observed trend of companies reallocating supply chains locally also referred to as nearshoring, helps reduce environmental impact, offering an optimistic view of potential alternatives for companies.

5.1.2 Technological Challenges – Blockchain Integration

While experts recognize the operational advantages of QR codes, reservations were expressed pertaining to the level of transparency within companies and concerning the integration of blockchain technology. The term “blockchain” is commonly associated with being disruptive across various industries but also tremendously transformative. Blockchain is an innovative secure database shared among a network of participants, public or private, that enables real-time access to constantly updated information. It functions as a distributed digital ledger that stores data of any kind. To put it simply, it is comprised of individual “blocks” of data that form a growing “chain” as new information is added, hence the term blockchain. Several key characteristics define blockchain technology. Firstly, it ensures transparent and permanent recording of data in near real-time. Secondly, it operates in a decentralized manner, meaning that no single entity owns or controls the network; decisions are made collectively. This network consists of nodes that validate and ensure the integrity of data. Thirdly, data can be distributed, with proof of the transactions stored in multiple locations, making it highly secure. Finally, once the file is created, it cannot be changed or edited, in other words, it is immutable, increasing trust, reducing the risk of fraud, mitigating data manipulation and unauthorized access. Blockchain can be applied to sectors beyond the financial, it can be leveraged where traceability and visibility are required such as in supply chains. While companies traditionally tend to retain information within their boundaries, this technology introduces a potential for transparency, decentralized data management, streamlined communication, and a more interconnected and efficient supply chain. However, despite the evident advantages, there are challenges to the widespread adoption. Integrating this technology requires adjustments and investments in existing information systems, which could be met with resistance as previously mentioned. Moreover, due to the complexity of the fashion industry supply chains, which deals with a vast amount of information, harmonizing these disparate data sources, and creating data points along the chain to create a unified, interconnected system will not be an easy task. It is also imperative to consider the need to scale solutions. As the industry expands and evolves, the data infrastructure must be robust to accommodate future growth to harness the full potential of this technology.

The undefined nature of blockchain and its potential impact across industries raises questions regarding standardization and regulation in the future. However, it also emerges as an innovative technological advancement for the industry, offering to digitalize and streamline processes, as well

as reliability and credibility of data (Agrawal et al., 2021). This transformative technology holds particular significance for the fashion industry as it can revolutionize how product information is shared, managed, and verified. BY leveraging blockchain, the industry enters an era that enables heightened accountability and improved traceability practices in supply chains.

5.1.3 Enhancing Transparency & Traceability

Data serves as the foundation upon which knowledge is built, it empowers stakeholders to make informed decisions, solve complex problems and catalyse transformative change. Understanding the importance of effectively managing this continuous exchange of information is pivotal in reshaping both general business operations and regulatory frameworks. Every piece of data, meticulously collected, stored, analysed, and transmitted reliably among legitimate stakeholders holds relevance within the value chain. Enter the DPP, a dynamic and agile tool designed to revolutionize stakeholder engagement throughout the product lifecycle. Developed by companies, the DPP serves as a conduit for conveying accurate and transparent information to three groups of recipients, companies, market surveillance authorities and consumers. As the information moves down this ladder, each recipient receives a tailored subset of information, underscoring the delicate balance required to ensure accuracy and transparency at every level. However, despite the evident benefits of robust data management, a significant gap persists between the growing need for data and the limitation imposed by insufficient data-sharing routines, hindering the realization of the industry's full potential. To address this challenge, it becomes imperative to prioritize strategies that foster a data-sharing culture while simultaneously upholding the principles of accuracy and transparency. Bridging this gap requires collective efforts from all stakeholders transcending technical considerations to embrace a more holistic approach that prioritizes data integrity and accessibility.

The issue of data management can be viewed from many angles. After engaging in discussions with experts, it again became evident that there is a substantial lack of accessible data. On one hand, certain stakeholders advocate the notion that having more data is usually preferable to having less. However, without legally obligating companies to disclose information, it becomes difficult to have access to the necessary data. They emphasize that the current deficiency lies in the absence of proper data to effectively inform decision-making processes, steer initiatives, and facilitate access to turn meaningful insights into actionable data. The prevailing sentiment within the industry is evident, most companies are keen on withholding proprietary data. This data is considered an asset, it often holds significant strategic value and contributes to the company's competitive advantages, therefore, safeguarding these valuable insights and operational intricacies from competitors becomes a priority. A nuanced approach is needed between fostering transparency, empowering consumers in their decision-making processes and safeguarding proprietary information that contributes to the company's distinctive positions in the market. Experts recommend implementing strategies such as tailored access protocols within the DPP to achieve this equilibrium. This ensures that sensitive data is accessible to authorized parties, while still allowing partial information to be shared among consumers. Although companies own and manage information since the DPP is developed by them, the EC's involvement ensures a balanced approach to data disclosure. However, requiring such vast amounts of information to properly characterize the products notably on sustainability and circularity, inevitably will lead to the disclosure of certain information that companies consider sensitive. The EC is, however, establishing what information is business sensitive

and which is crucial to make public to achieve the objectives delineated in the DPP. It can be anticipated that there will be some cases of a conflict between the need to keep privileged information secret and the overriding public interest in making that information public.

Education assumes a significant role in this matter, not only for consumers but for all stakeholders. By comprehending the rationale behind the sharing of certain information and recognizing its broader benefits for the industry, stakeholders are more likely to accept and support transparent practices. In essence, the call for this balance can be seen as both a challenge and an opportunity, reflecting the complexity of integrating transparency initiatives into an industry accustomed to guarding its internal workings. Nonetheless, the fact that efforts to digitalize supply chains offer opportunities and help businesses thrive, is often overlooked. Requiring businesses to adhere to transparency standards, tracing the journey of their products and reconfiguring supply chains to exchange data at the various points along the chain has substantial benefits for these companies. Understanding these processes enables a better visualization of the entire supply chain to closely monitor the production process, but also readily identify inefficiencies in the chain, reduce costs and capitalize on opportunities, ultimately optimizing business strategies. In addition to this, it also has the potential to facilitate decision-making, and risk management and foster trust amongst consumers who are increasingly concerned with the impacts of their purchases. Agencies themselves can act as catalysts for the adoption of the tool, emphasizing the importance of early industry involvement and collaboration in driving sustainability initiatives.

The EU is currently engaged in assessing the overall impact of the DPP, making it more comprehensive and ensuring a smoother transition by engaging in public consultations and collaborating with stakeholders. The development of this tool involves input from various sources as its implementation is expected to be exceedingly complex. Therefore, a well-rounded approach is necessary. The creation of these requirements across diverse product categories, that function seamlessly, in a standardized format, and with clear communication protocols in an extremely complex industry will be the ultimate challenge. Commonalities exist among both producers and consumers regarding the information requirements for the DPP, they underscore the importance of tailoring DPP content to meet both consumer and industry needs while considering the feasibility side of it. The information requirements could be quantitative or qualitative, this matter is yet to be agreed upon by the EC. In terms of the quantitative requirements, the Commission must have testing methods and standards to substantiate the requirements themselves. Therefore, the task of formulating delegated acts for the DPP requirements will not be straightforward, a balance must be struck between the information consumers desire to see, what companies can disclose in matters of confidentiality and what is feasible to require. As articulated by the EC, careful consideration must be placed into reconciling the “need-to-know” and the “nice-to-know” aspects of the information, determining the essential and critical information that fulfils the DPP objectives leading to informed decision-making. The matter of confidentiality should not be used as a pretext for withholding information that damages company’s reputation. Instead, it should incentivize organization to proactively address shortcomings, adopt more sustainable measures and showcase their commitments to responsible efforts.

Drawing back to the informational governance framework, the adoption of the DPP requires processes of information construction in an industry that is reluctant to share data, which underscores the need for robust processes of information construction, as previously stated. This

transition will be met with resistance from stakeholders regarding accountability and transparency concerns in their supply chain operations. The adoption of this tool, will require companies to navigate the complexities of integrating digitalized practices into existing structures, exploring innovative technologies and communications channels. Online platforms can further facilitate the adoption, as an extension of the DPP physical label, streaming data exchange and transparency in all selling points. As companies prepare of this implementation, a phased and early approach is recommended as institutional shifts can be expected and upcoming regulatory reforms must be met. These aspects support the existing framework, in understanding the dynamics for driving sustainable transformation and reducing the industry´s footprint. These insights can serve to inform stakeholders of the upcoming changes, allowing for strategic planning, and guide policy development.

Although companies are afraid of the above-mentioned challenges of implementing this tool, it also represents exciting business opportunities. By having this tool as a harmonized base on which everyone can rely on and follow the same rules to characterise their products, a level playing field is formed. All stakeholders comply and compete under the same scientifically proven rules. The idea is to have companies that put forward products that comply with the requirements and possess a high environmental score to be rewarded with higher profit margins and value-added. While the low-performing environmental scores are banned from selling in the European market (*Interviewee I08*, personal communication, January 2024). Essentially, the idea is that issues such as greenwashing practices which mislead consumers, cease to exist. This transition to digital product identification offers practical advantages such as improved product identifiability and reduced likelihood of information loss. Experts view the DPP as a sustainable opportunity and a positive influence, positioning it as transformative.

Moving on to understanding consumers, value perception and behaviour towards the future use of the DPP becomes pivotal. This research, combined with the literature review shows that consumers often make purchasing decisions based on the perceived value of products, which is not only based on the monetary value but also its sustainability and ethical attributes.

5.2 Consumers in the Digital Era: Perceptions and Strategies

This research not only informs consumers about the future of their purchases but also enabled an understanding of what captivates their attention, drives more sustainable consumption choices and the values consumers prioritize. Addressing the research questions for the consumer impact, the segmentation of respondents into future, potential and unlikely DPP users provided a more targeted analysis of the perspectives and the consumer dynamics of the future utilization of the DPP and strategies to enhance its effectiveness. To gain insights into how consumers will perceive and utilize the DPP, a closer inspection into the future users revealed valuable insights.

In general, in a capitalist system guided by supply and demand, the significance of consumer choices is undeniable. Consumers are undergoing a notable transformation towards more sustainable purchasing habits driven by a heightened awareness of the environmental and social impacts associated with their choices. This trend reflects a growing consciousness among consumers, who are increasingly prioritizing sustainability considerations in their decision-making processes.

However, this dynamic becomes complex due to the attitude-behaviour gap, where consumers' sustainable intentions do not always translate into purchasing behaviour. Without mandatory legislative tools, brands have little incentive to reshape their current models towards more sustainable ones if consumers do not effectively demonstrate a shift in their consumption models. As long as companies report annual growth and profitability, why should they invest time, resources, and efforts to change their existing practices that have proven successful. This is to say that, along with regulatory measures, a vital strategy to shift existing models, is to target what fundamentally drives brands and their purchasing customers. Fashion, mainly the fast fashion industry tends to prioritize short-term objectives, profit, trendy designs, and affordable prices, but the reality is more complex than that. Fashion is often dismissed as superficial, but it reflects an interplay of economic, societal, and psychological factors such as human desires, societal norms, and personal identity. Consumers frequently view fashion as a means to express their identity, showcase their individuality, and seek social validation. Consequently, the sense of belonging and personal identity gained through the act of making purchases often outweighs and holds greater significance than consumers' values and beliefs. By understanding these psychological triggers of unsustainable consumption, we can better understand how to encourage a more sustainable one. The fashion industry can move towards a model where consumers do not have to choose between buying sustainably and expressing their identity, which is where the DPP comes in. It can lead to more impactful targeted strategies that showcase an understanding of the consumers and encourage sustainable consumption and increased participation.

5.2.1 Consumer Awareness

The literature review underscored that consumers are likely to view and perceive the DPP as a valuable tool. The expectation is that consumer awareness will increase by delivering comprehensive information regarding the environmental implications of fashion products. The questionnaire results further affirms this perspective, revealing that the majority of future users agree that having access to this tool would positively impact their ability to make sustainable choices. This suggests a potential link between the perceived impact of the DPP and the sustainability considerations of future users. Consumers are likely to utilize the tool not only for basic information but for a broader spectrum of details, they are looking for a comprehensive overview of the entire lifecycle of products, covering both environmental and ethical aspects of products. Future users seek information that enables them to make informed decisions, aligning with the broader trend that consumers are becoming more conscious towards the sustainability aspects of their purchases. These users are likely early adopters of the DPP, showing a positive alignment with DPP impacts which is crucial to maintain, finding strategies to keep this segment motivated to incorporate the DPP into their daily purchases. However, even though consumers may view the DPP as a tool for accessing information, the CLT suggests that consumers may at times perceive sustainability as psychologically distant, which could in turn affect their engagement and ultimate success of the DPP. In this context, the DPP serves as a tool that brings the abstract concept of sustainable closer to the consumer, by providing concrete, understandable information to their purchases. Consumers positive perception of the DPP as a valuable tool reflects their desire for a high-level construal of sustainability related information. It shows that they are seeking a broader spectrum of details, comprehensive knowledge rather than detailed information, aligning with the theory’s proposition

that individuals tend to focus on the broader pictures when consideration concepts that are psychologically distant. Moreover, consumer intention to utilize this tool indicates that they aim to bring sustainability considerations closer to their decision-making process and, therefore, reduce the perceived psychological distance between themselves and sustainable decisions.

While the DPP emerges as a more transparent, informative, and reliable solution, it could potentially face challenges due to an existing trust deficit from consumers. Greenwashing awareness is present, but not universal, however, the prevalence of instances where consumers felt deceived by clothing labels underlines a trust issue among consumers in product information. This observation from the research is reinforced by consumers' substantial interest in certification marks, emphasizing the need for trustworthy third-party verification as well as credible and transparent product information. Meeting this expectation is pivotal in the successful implementation of the DPP, building trust, accuracy, and credibility in the information available. In the broader context of moving away from greenwashing practices, the DPP emerges as a promising tool to help combat this issue. As a platform conveying the environmental footprint of products, the DPP addresses the information asymmetry that allows greenwashing practices to thrive. Gaining access to reliable information about the products equips consumers to distinguish between genuinely sustainable products and deceptive marketing tactics. The implementation of the DPP not only fosters a market environment where sustainable choices are rewarded but also aligns with the growing trend of consumers actively seeking sustainable solutions. Numerous reports highlight examples of companies benefiting from sustainability efforts, and governments, along with industry bodies are increasingly recognizing and rewarding such initiatives. This positive recognition, coupled with incentives and support, ultimately benefits consumers and contributes to the broader shift towards sustainability in the fashion industry.

Public institutions play a leading role in the prevention and future elimination of greenwashing practices by serving as enforcers and regulatory bodies of ethical standards in business practices. One of the primary responsibilities of these bodies is to establish and enforce clear guidelines as well as definitions of what can be considered genuinely sustainable practices. Earlier in 2024, the European Parliament approved a directive designed to ban the use of misleading environmental claims and improve product labelling, a ‘green claims directive’ (Directive 2024/825). These new rules aim to ban problematic marketing habits related to greenwashing and restrict the use of terms such as “environmentally friendly,” “eco” and “biodegradable.” Furthermore, as previously stated, the ‘green claims directive’ will be relevant to control the substantiation of environmental claims more concerning the companies producing the products and the services associated. Both these directives provide a basis for public institutions to monitor and penalize companies engaging in deceptive marketing as well as provide authentic information to consumers. Moreover, companies will have a legal base to characterize how green they are, in essence, they will be statutory measures that everybody will trust. However, while these rules are crucial, their effectiveness depends on the level of awareness from consumers as well as their robust implementation and continuous monitoring. Public institutions should not only educate consumers but encourage transparency in reporting sustainability metrics. This involves disclosure and the promotion of standardized methods for measuring, facilitating the comparison and evaluation of sustainability claims for consumers.

5.2.2 The DPP Label

The DPP, functioning not only as an enforcement tool but also as a comprehensive consumer information resource, intends to contain large sways of information related to the product. To make this wealth of information more accessible and engaging to consumers, a proposed solution involves the development of a label that captivates consumers. This label succinctly summarises and characterises information in terms of their sustainability and circularity. The design of the DPP label should not merely present information; it should be crafted to be visually appealing, easily readable, comparable and above all, understandable. However, its significance goes beyond mere readability, it should encapsulate insights from consumers' preferences and desires, ensuring that the conveyed information is meaningful and conveys feelings.

Furthermore, the EC intends to make the social sustainability aspects of products, also called ethical practices, a part of the corporate sustainability due diligence, as they are not part of the ESPR and consequently the DPP framework. This entails large and medium-sized textile companies demonstrating, via comprehensive reporting, their adherence to internal corporate due diligence policies that ensure compliance with specific social sustainability measures. However, the EC is currently debating whether to link the DPP to other aspects such as care instructions, social aspects and ‘made in’ labelling. And despite the current absence of social sustainability measures such as minimum wages and prevention of forced labour in the DPP, research findings indicate that consumers value characteristics beyond environmental aspects which include sustainability and circularity. Results showed that a potential extension of its scope to include social aspects and care instructions must be taken into consideration. This underscores the importance of informing consumers before and after purchase about the various product characteristics, extending beyond the environmental aspects to encompass social sustainability and animal welfare. Future users are concerned with aspects encompassing the material composition of products including the presence of harmful substances, socially responsible products, as well as longevity and maintenance.

Moreover, future users have the potential to become loyal, long-term users of the DPP as long as certain standards are met. It is essential to strike a balance between the amount of information the DPP provides and consumer engagement. On one hand, the information present should englobe the aspects consumers value and consider in their decision-making process, on the other, it should be appealing, understandable, but mainly trustworthy. Transparency, accountability, and responsibility were designated in the literature review as crucial in positively influencing purchasing decisions, enabling standardization, harmonization, and authenticity which in turn leads to growing trust among consumers. High interest in certification marks from the consumer questionnaire highlights a consumer demand for transparency, recognized certification standards are needed to establish and promote trust and credibility. Ideally, by providing transparency and detailed sustainability information, the DPP can reinforce consumers' sustainability identities, making them more inclined to choose the products that align with their values. Overall, the DPP label is poised to reshape consumer's interactions with purchases. It should create a narrative that emotionally engages and resonates with consumers, enabling and fostering a deeper connection and awareness of the true implications tied to their purchases.

5.2.3 The Central Role of Environmental Education

Consumer education emerged throughout this research as a central concern in both existing literature and the expert interviews, as well as from the questionnaire results. Education plays a pivotal role in the successful implementation of the DPP as educating stakeholders about the opportunities, functionalities, and benefits of the DPP, and preparing them for inevitable change becomes crucial. The results from this questionnaire showed that scepticism exists towards the DPP's impact and having a higher degree does not necessarily translate to trusting, believing, or adopting it. The nuances in consumer attitudes highlights the importance of understanding why consumers are not ready to embrace sustainability tools like the DPP. It emphasizes the need to address sustainability education comprehensively, ensuring that consumers are adequately informed and motivated to adopt these practices. For the DPP to become a successful and effective tool, more consumers need to believe and understand its impact. Sustainability is typically incorporated into primary school programs (from around 6 to 15 years old) with activities such as field trips, art projects, posters or research projects spanning over these years (Green Education Initiatives, 2021). However, as students' progress through these initial grades, there is a noticeable shift away from sustainability-focused topics towards more traditional subjects such as mathematics, literature, and the sciences. Sustainability should be part of student's curriculum throughout their entire academic journey, it should be a dynamic and evolving subject like others, addressing more complex problems, debating ideas, and collectively discussing solutions. The idea is that throughout this journey, sustainability becomes integrated into their academic curriculum, students gain environmental consciousness, learn from others, and grow more aware from early education to more advanced degrees. Environmental education should stay away from conventional paradigms which demands a transformative shift. To cultivate environmentally conscious minds, it can be argued that the adoption of a systems-level educational approach can be relevant in helping students realize the dimension of the problem, make connections, and think of solutions. Schools tend to move away from structural change thinking mainly due to curricular limitations, traditional paradigms, and resource constraints. However, this prevailing narrative must change, schools must no longer assume that recycling initiatives are enough to be considered "environmentally friendly," engaging in sustainable practices goes beyond individual action. The curriculum must be redesigned to consider the future, climate literacy must be developed, and students should have a sense of environmental responsibility and active citizenship. To increase and create awareness, students should be taught about the importance of these issues, and the need for action and in a way feel the urgency and turn it into critical thinking and problem-solving. Sustainability is an inherently sensitive topic, often overlooked until people witness the tangible negative impact and consequences of their actions. It is when individuals begin to read about facts and see degradation with their own eyes that they tend to become concerned. In other words, the connection between personal actions and their repercussions on the environment becomes palpable when people are confronted with reality.

These overarching points provide a rich foundation for discussion, offering promising avenues for strategic recommendations, policy considerations, and potential areas for further research and development of the DPP.

Chapter 6: Limitations

While the research intends to provide a comprehensive overview into the adoption and perception of the DPP, it is essential to recognize several limitations that may impact the interpretation of the findings. In semi-structured nature of the producer interviews. While allowing for an in-depth analysis of the conversations, might introduce subjectivity and variations in responses. Firstly, the selection process for experts was conducted through my own network which may have potentially led to a limitation in terms of the diversity of perspectives. Secondly, the selected experts were not all fully aware of the DPP, a further explanation was given on the aspects of the tool in order to have a discussion. This lack of knowledge could influence the accuracy of their responses. Thirdly, the questions were slightly adjusted depending on the expert's job position to enable to more tailored discussion, however, this can potentially introduce a source of bias in the responses. This may inadvertently influence the direction of the conversation, leading to a focus on certain aspects, while overlooking others. Moreover, the accuracy of the data provided by the experts depends on the extent to which they are permitted to share company information openly.

Furthermore, it is essential to recognize potential limitations with the questionnaire that may influence the interpretation of future findings. The questionnaire's closed-ended question format even though provided objective and reliable data, a more open-ended, qualitative approach could have allowed for a deeper exploration into consumer attitudes and expectations. Additionally, sampling considerations must be considered as this process may introduce bias and the participants are not fully representative of the entire population as per the margin of error calculations. Additionally, the majority of respondents are from Portugal and the Netherlands which may not fully represent the diversity of the European Union, potentially limits the generalizability, scope, and applicability of the findings. Results also showed that the age distribution skewed towards the 19 to 28 age group potentially influencing the results to be more reflective of younger consumers.

This is to say that expanding and diversifying the demographic profile of participants could provide a more inclusive representation of perspectives. The limited number of participants lead to a limited statistical analysis, which in turn signifies restrictions in the generalizability of findings to the broader population. Moreover, a study found that some participants don´t read the instructions given before answering questionnaires (Vésteinsdóttir et al., 2018). Therefore, the matter of participants insufficient knowledge must be considered as this is a new tool and its understanding is crucial to accurately provide informed responses to be analysed. Secondly, questionnaire responses may be susceptible to response bias, as people may provide answers, they consider to be more socially desirable rather than what truly reflects their behaviour or randomly selected responses. Thirdly, the variability of the Likert scales must be considered, different scales of agreement to satisfaction levels may introduce a level of response inconsistency and ultimately in the way the data was analysed. However, due to the nature of the questions different scales were best suited to reach the research objectives. In terms of data analysis, mean and standard deviation calculations were used which potentially oversimplifies the complexity of the results and the conclusion regarding the intricacies around consumer behavior. In addition to this, the analysis primarily focused on positive attitudes towards the DPP without exploring the negative responses more in-depth.

Additionally, while the findings of this study are applicable to the fashion industry, they may not be necessarily applicable to other industries, careful consideration must be given to this aspect when extrapolating findings. Additionally, the fast-evolving nature of technology, consumer attitudes and EU legislation may impact the relevance of findings over time. It is important to note that this research captures a snapshot of the current state of the DPP; therefore, future developments may alter this landscape.

This study's findings shed light on the fact that the DPP is still relatively new terrain to both producers and consumers in the textile industry. Stakeholders are still in the process of familiarizing themselves with this concept, which presents a unique opportunity for targeted educational initiatives. Consulting companies for instance could benefit from providing training and guidance on integrating the DPP into businesses processes while consumers might benefit from campaigns to elucidate the long-term advantages and significance of the DPP. Moreover, a moderate sustainability consideration was found among consumers, signalling the existence of mindful consumers. The introduction of the DPP holds the potential to evolve into an active engagement tool, reshaping the consumer into a key enabler of sustainable initiatives, making informed, conscious decisions, and safeguarding themselves against potential misinformation. However, the coexistence of limited awareness of the DPP alongside the moderate sustainability consideration signifies an emerging awareness and a nuanced consumer landscape. It suggests a baseline sustainability consciousness that can be cultivated using the DPP to induce awareness and consumer education in the impact of purchases. Further research and more collaborative efforts are needed to address further challenges as more information becomes known.

Chapter 7: Conclusion and Recommendations

The aim of this research is to explore the relationship between consumers' intentions and attitudes as well as producers' behaviours with initiatives such as the digital product passport. By understanding this relationship, a more in-depth exploration of the psychology behind sustainable consumption choice as well as practical implications for both policymakers and businesses can be studied. Additionally, this information can offer insights into how to shape future digital product passports as a successful and useful tool for both consumers and producers. The central research question is: **What are the potential implications of the Digital Product Passport for stakeholders in the fashion industry?**

My research reveals that DPP emerges as an opportunity to modernise, digitalize, and revolutionize supply chains and product information to support the shift towards circularity and sustainable, industry-wide transformations. The exploration of the DPP reveals a complex landscape marked by various challenges but also opportunities. The successful implementation of this tool, which requires a transformative and comprehensive shift in most companies, can only occur when there is collective commitment from all stakeholders.

The following can be mentioned regarding the sub-question of what challenges are anticipated for fashion producers to face when integrating the digital product passport into their operations (SRQ1). For producers, this commitment involves a willingness to embrace these changes, a forward-looking strategic mindset, and financial motivation. In addressing global supply chain dynamics, the industry

calls for a phased approach to adapt and accommodate these changes and integrate them in the deeply ingrained current practices. Technological challenges, notably blockchain integration, present opportunities for efficiency and transparency but require careful consideration in terms of sharing and protecting proprietary data as well as standardization when enhancing transparency. The potential conflict between public interest and business secrecy in the matter of data can be anticipated.

In terms of the consumer role in the DPP, more specifically, how will consumers perceive and utilize the digital product passport when making purchasing decisions for fashion products (SRQ2) there is a prevalent sentiment that changing consumer behaviour is an insurmountable task. However, while it is a challenge, our society cannot afford to rule them out when it comes to change. Even though the power to change cannot completely fall on consumers alone, we are living consequences resulting from collective inaction. This predicament was created due to a complex web of interaction and decisions by brands, consumers, and governments alike. This research highlighted the attitude behaviour gap and the need for strategies that engage and educate consumers to enable more sustainable intentions and choices. Discussions throughout this study illuminate the dynamic landscape surrounding the DPP integration in the fashion industry. A successful DPP implementation, as results showed, must englobe a series of considerations. The most crucial feature of the digital product passport must be to deconstruct the concept of sustainability into something tangible, concrete, and practical, making it a useful tool for people to use in their day-to-day to make more conscious decisions. Consumers are expected to utilize the DPP as a versatile and personalized tool, relying on it to access an extended amount of information that goes beyond the current situation of clothing items and beyond environmental aspects to consider ethical information as well. Beyond this, consumer education emerges at the centre of strategic considerations for a successful implementation, integrating sustainability beyond the elementary level.

Most of the actions that have been taken have raised the discourse on the topic but lack true transformative systemic changes. Understanding sustainability is challenging as it often appears as an abstract concept despite its significant relevance. This tool must be constantly changing and learning from consumers, the effect that the parameters present have on individuals must be studied in depth. The concepts of sustainable identity and psychological distance are crucial to gain deeper insight into who exactly is the consumer, what they are looking for, and how to prompt curiosity into individuals to understand the information provided. The digital product passport cannot be another complicated and confusing requirement for products, much like the ingredient list with terms that are challenging for the average consumer. Ideally, the digital product passport would consist of a full disclosure of the entire supply chain of products from the producer side, which would then be stored and used for calculations such as the footprint of that product made simpler for the consumer. The idea is to generate conversation, gain an understanding of what would be ideal and investigate what would be impactful for all stakeholders (producers, policymakers, and consumers).

Thus, the final SRQ3 of what strategies can be employed to enhance the effectiveness of this tool in promoting sustainable consumption behaviour the following can be mentioned. A future research approach would be to gather a focus group to validate findings, to gain a more in-depth understanding of how consumers utilize and interpret the information from the digital product passport. Based on these conversations, a better understanding of the key drivers can be provided as well as the ability to receive and discuss feedback from the group to collect ideas, possible

barriers, and opportunities to ensure a smooth transition of the DPP into consumer's daily lives. In addition to this, it could be introducing a longitudinal dimension to the research, revisiting participants, and conducting follow-up conversations to determine how consumers have over time integrated, or not, the DPP into their purchases.

7.1 Business Implications

Business models cannot be outright banned, meaning that fast fashion cannot simply disappear. The idea is that by requiring minimum performance in terms of sustainability and circularity from products, certain business models or strategies such as fast fashion, become either illegal since they do not meet the minimum requirements or unprofitable. The turnover of collections which are characteristics of fast fashion will become a burden for companies as they will have to spend more money to make their clothing items meet the future EC's minimum environmental criteria. Currently, there are no rules preventing companies from manufacturing inexpensive, high-polluting clothes, highlighting the necessity of establishing a minimum standard that the product must meet. Ideally, in the future, it might become environmentally and economically unviable to sustain the current rapid and large-scale production characteristics of fast fashion. Business models will have to redesign themselves to accommodate these novel changes.

The DPP is not a new concept, other forms of this tool exist and are already widely used. In reality, nothing prevents companies from already implementing the DPP to equip their products. Preparation for these changes must be considered to avoid a shock, companies should already begin thinking about implementing a phased approach to maximize net benefits and engaging with industry partners to start discussing the forthcoming changes. It is equally important to also consider the risk factor and its impact on the business. When exploring long-term opportunities, must be considered, and risks must be prepared and assessed to quantify the magnitude of potential exposure. This includes analysing the implications of non-compliance with the DPP, such as market repercussions, potential fines, impact on net sales and the company´s internal and external reputation.

Before delving into the next section, a small focus group was formed to discuss more in-depth aspects of the tool, exchange ideas derived from this research, and suggest future measures and recommendations concerning the specifications and design considerations of the DPP.

7.2 Recommendations for Businesses

As businesses are obligated to adhere to the requirements outlined by the European Commission, they are responsible for the development of the tool itself and its design. The decision to merely comply or take extra steps to transform it into a tool that shapes consumer choices towards more sustainable outcomes is ultimately contingent on businesses' commitments to sustainability and recognition of the tool's long-term benefits. However, companies need to exert influence.

The discussion chapter revealed a series of challenges that can potentially hinder the successful implementation of the DPP by producers. It became evident that early industry involvement is paramount as a first step to better prepare for and mitigate these challenges. Adopting an early and

voluntary DPP allows for producers to gradually adapt to the new requirements, and changes in infrastructure as well as test feasibility and the effectiveness of the tool before the full-scale integration. This could include small-scale pilot projects using and testing blockchain technology in real-world supply chain scenarios and implementing robust tailored access protocols to safeguard sensitive information and prevent unauthorised access. Additionally, it allows for a better visualization and realization of the costs associated with this change, and if necessary, the exploration of financial support. Furthermore, providing education, training, and capacity-building incentives to help producers understand the technical requirements, impact on the company and operational shifts that are needed to navigate the complexities of data management while promoting transparency This can include workshops, seminars, and online resources tailored to the specific actors involved. Fostering collaboration and partnerships can also help ensure a smoother transition, as businesses can learn from each other, encourage information sharing to accelerate the adoption process, provide feedback, identify areas for improvement and overcome barriers.

The analysis also sheds light on the fact that consumers care about the information presented through the DPP, a tool that is easily accessible to make it part of their everyday purchases. Hence, clarity, simplicity, and a presentation that incorporates hard facts in a visually appealing manner should be prioritized when organising information within the tool. The emphasis lies on structuring data in an easily comprehensible way, avoiding unnecessary and complex information and ensuring that the essential aspects of the product are present. Businesses are not yet concerned with the design of the DPP, but they should view this as an opportunity to foster positive consumer engagement and may find it advantageous to invest in an innovative, user-friendly, design as a strategic approach. The DPP must be seamlessly integrated into consumers' everyday purchasing experiences to be tremendously successful. The goal is not to deter consumers from making purchases but to empower them to make more informed decisions. This implies that companies produce more products that meet sustainability standards to avoid discouraging consumers from purchasing.

Furthermore, the role of social media in the successful development of the tool must be highlighted. The EU does not possess a social network platform as all the major platforms come from outside, the DPP will bring invaluable data creating an extensive European database. Having an EU database has the potential to better inform not only businesses but policymakers, facilitating decision-making and enabling more targeted and effective policies. The appeal of online shopping and social media must be leveraged by providing sustainability information directly on platforms like Instagram, making it a global initiative, accessible to a global audience while integrating the DPP into widely used platforms. As stated by the EC, the DPP aims to be present on web pages as a digital label. This will not only attempt to make sustainable information more attractive to consumers but also facilitate more conscious purchases through social media. To further encourage sustainable choices, the DPP app could implement a reward system, offering discounts or incentives for those opting for products with a lower environmental impact. This could also involve establishing partnerships with sustainable consortia that create appealing incentives leading consumers to prioritize eco-friendly options. Finally, an out-of-the-box idea that came up during the conversations was the introduction of a personalized sustainability score within the DPP app. Consumers often make purchasing decisions in a matter of seconds, therefore, it becomes imperative to design a DPP app that caters to their need for quick and informed decisions. The concept revolves around each user having a unique avatar within the app, customized with their preferences and priorities of information that matters

to them and aligns with their values. These preferences are then assigned scores on a scale, ensuring a swift and straightforward understanding of the product's sustainability attributes. Using artificial intelligence, this avatar not only adds a fun and engaging element to the user experience but is also certain as an effective tool that personalizes and simplifies information, ultimately fostering a deeper connection and consciousness to an individual's choices. Given the fast-paced nature of the decision-making process in fashion, the DPP should seamlessly accompany it, indicating to the consumer whether the product constitutes a sound Purchase in line with their values. This ensures a quick and facilitated informed decision-making experience for consumers.

7.3 Recommendations for Policy Makers

There is a pressing need for education systems to be resigned by policymakers to incorporate sustainability education into curriculums, it is now imperative that future generations are equipped with the knowledge, skills, and mindset to face and address these issues. Achieving this social tipping point requires practical, top-down, and bottom-down solutions. First, integrating compulsory sustainability classes into the school's syllabuses ensures a long-term approach towards a transformative shift. Second, the injection of programs to flip consciousness, such as climate academies CITE that aim to shape future change makers and open classrooms to sustainability discussions. Primary and secondary school curriculums tend to remain stagnant and fail to evolve with the changing dynamics of our society, this also involves more education and training for teachers, as curriculums evolve, teachers must do so as well. Lastly, online learning, podcasts, webinars, and ways to motivate and engage students in certain topics, helping them become more well-informed and training them in a lifelong learning process.

Consumers expressed concerns that they may not be able to understand the information provided, drawing parallels with the intricate labels found on the back of our food packages or cosmetic products. These tend to often incorporate complex terms that despite their presence, are challenging to fully understand. Requirements such as the amount of water a clothing item consumes, are expected to be on the DPP, and individuals expressed concerns with the fact that they might not understand what *x* litres of water means, as previously mentioned. Therefore, it was suggested that a visual or impactful representation of the data could be useful to help better interpret it and evoke emotions in consumers. For instance, showing that *7,000* litres of water is the equivalent of a certain number of water bottles or even of what the average person should drink over 7 years CITE. While this numerical value might signify a substantial amount of water, its impact is heightened when translated into a feeling and meaning to consumers. Additionally, it was suggested that offering a comparison, stating what would be the acceptable amount of water for that clothing item or a more environmentally friendly options could help in the decision-making process. The overall design of the DPP should be user-friendly while promoting factual accuracy and a straightforward understating of a product's environmental and ethical aspects.

Another concern raised was the fact that valuable information, such as care instructions, is often overlooked. Some points were brought to attention regarding the consequences of ignoring this information, noting that clothing items tend to lose colour faster, fade or shrink. Understanding these potential outcomes and realizing how proper care can extend the lifespan of clothing items can make consumers more alert and aware. Relating to the end-of-life, participants struggle to find

information regarding the disposal of clothing items. Ideally, they would like to see spots nearby to recycle their items, donate or offer more choices to dispose of them properly. Overall, it was agreed that sustainability is often placed in the second or third place when it comes to purchasing products; consumer prioritizes the likeness and the price of their clothing items over sustainability concerns. At the end of these discussions, consumers concluded that they knew little about the true impact of their purchases.

This is to say that these aspects should be thoroughly considered and addressed before the DPPs released into the market, as well as exploring options for providing financial incentives or subsidies. On the producer side, this could include subsidies to upgrade their information systems and infrastructures, tax incentives for investment in digitalization and sustainability initiatives. On the other hand, on the consumer side, it would be recommended that policymakers invest in financial incentives on the education aspect of the issues.

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Appendix

1. The Interviews

1.1 Questions

1) Since the digital product passport is still a pilot project and is not yet on the market, can you explain your understanding this tool?
2) What do you think could be possible implications of the DPP to your company and to the industry?
3) What benefits and challenges do you believe you will encounter when implementing the DPP?
4) Do you see the DPP affecting your company´s relationships with suppliers and consumers?
5) Can you see it influencing your company´s supply chain particularly in terms of transparency and sustainability?
6) What are the requirements you expect to be on this passport available to the consumer?
7) How do you envision the DPP contributing to a more circular economy to the industry?

1.2 Transcripts

Interview I01- Imendo Consulting Group

Backgroud – Worked for Adidas, Ecco, VF

Imendo is currently working within the pharma industry where a tool similar to the DPP already exists called serialization which focuses on optimizing supply chains, it is an EU regulation for pharma. The goal of this tool is to continuously improve supply chains and provide better relationships between companies and supplier. Unlike the fashion industry, pharma's mainly focus is production capacity since most of their stock is sold regardless. The fashion industry's main focus is consumer experience, they focus all their efforts on exciting and impressing consumers.

Imendo is trying to start preparing clients for the implementation of the DPP. The consumer experience in fashion is obviously different from pharma. The fashion industry focuses all their efforts in exciting and impressing consumers. Patagonia for instance, is the only company that doesn´t care if their revenue goes down if they stay afloat. My theory is that if you are pure (a green company), there is opportunity, and therefore this compliance that comes with the DPP is no longer a burden.

The idea is that the DPP makes information dynamic instead of static. However, there are major technological barriers with the integration of the DPP into the existing systems. It will completely revolutionize supply chains, as I believe that we will see data points along the chain and visualize the journey of products.

As a consultancy agency, the biggest challenge I see right now is convincing companies to start preparing for the DPP implementation. It is inevitable and the sooner companies see it, the better. Adapting supply chain to this concept won´t be an easy task. In addition to this, there is a possibility that companies might simply meet the compliance standards of the DPP and not go the extra mile.

At Imendo we are looking to start introducing the DPP to clients through multidisciplinary teams, collaborating and we see it as a vehicle to drive our sustainability agenda. Overtime, I believe that suppliers in the industry will positively adapt to these changes, but if that doesn´t happen they companies will be forced to choose suppliers that do adapt. I´ve been observing that some companies are reallocating supply chains and suppliers to more local spots, closer to their operations, making smaller shipments more frequently, this process is called nearshoring. This aims to decrease transportation costs and ultimately decrease the environmental footprint.

Requirements – I believe that the requirements will include, carbon footprint, labour conditions, wastewater, PFAS, material composition and end-of-life information.

In terms of whether I believe consumers will make the DPP a part of their purchases, Americans for instance can´t resist a QR code scan, they scan everything. But especially, for the younger generation that are more concerned with the environment, and want to make purchases with a clear conscious, I see the DPP being a positive tool for them.

I02 - PVH Group

Background – 2 years at Calvin Klein

From the operational point of view, tracking and tracing is extremely difficult.

At PVH, we are constantly concerned with choosing the best, most sustainable materials. We are also careful with where these materials are made, from an ethical point of view. Our products are made in factories that are spread out, so we don´t focus all our efforts on one single factory and overworking workers. For me such low prices don´t make sense, even high fashion brands make use of cheap labour but then sell it at a high price. We are always looking out for waste recycled trends such as what Stella McCartney and Ferragamo do, creating clothing products using materials made from waste.

Supply Chain – I think the DPP will a huge positive impact on the supply chain. Of course, it has some pros and cons, but I see mostly pros. We will be able to follow production in a much more efficient manner, it happens quite often that vendors get focused, style or wash codes get lost and messes up our scheme. If everything becomes digital, that takes a big weight off of vendors, it becomes an issue

for the IT department and engineers to solve. People at the factories already have too much to oversee and I strongly believe that IT is the future.

Transparency - if companies are against it, it means they have something to hide.

Requirements – As a consumer I´d like to see material composition, origins, supply chain journey (locations), timeline and user reviews as this could also give companies feedback on their products so they can improve the quality in the future. As a supplier, I´d like to see information related to the chemicals used, treatment and washing methods.

Affecting relationships – I only see benefits, I think it will improve our relationships as it will make both our jobs easier as I previously mentioned.

I also see less consumer waste with the DPP, as requirements regarding durability for instance can help consumers learn how to make their clothes last longer and buy from more durable materials. Right now, we can´t really know for sure if the items we buy are truthful in terms of recycled percentage for instance.

I03 - Karl Lagerfeld

Understanding – The DPP is the journey of products from beginning to end.

Challenges – I see two blockchains, one for suppliers and a different one for consumers, however with this comes a major issue for businesses as 100% transparency means secrets will be exposed.

Benefits – From an operational point of view, I see a huge advantage in having a QR code as it will make paper labels a thing of the past. We struggle a lot with the paper labels, and they get lost, and it complicates the entire process, leaving us without the ability to trace it. The DPP will bring 100% product identification. My recommendation would be to embed the QR code within the garments tissue, maybe in the sleeves and they are sowed in the inside of the garment.

Affecting relationships – We care about the emotional happiness of consumers.

Supply chain – In terms of the supply chain they will need to react and be replanned. My questions is, will the European Commission rate processes?

The blockchain concept is still undefined, will it be open, closed? The concept to me is very much around data-driven solutions, and I believe the blockchain disrupts everything it touches.

I04 - Carrefour Group, Dubai

Understanding - It is a tool that allow you to get information via a QR code scan regarding the entire supply chain of garments.

Implications - Promoting sustainability is on carrefour agenda, not as much as in other countries in Europe but still high on the agenda. Dubai is trying to match with what Europe is doing and embracing sustainability. It is important to understand who the consumer at carrefour is, they are promotion drive, big volume, and low prices consumers. For that reason, I am unsure whether the DPP will add too much value to these consumers. However, as a company, sustainability is high on the agenda and having a transparent supply chain could help promote that and transparency is one of our goals.

Supply Chain benefits – I see where that could help reduce costs and increase efficiency for such a big company like ours.

Requirements – I guess as a supplier and a consumer I´d like to see information regarding the material composition, fabric supplier, manufacturers information, origins (the journey of our products), transportation (e.g., electric vehicles).

Challenges – Carrefour is the lower prices segment, meaning we have narrow margins of around 40%. As I previously mentioned, transparency is a goal, however we must protect out name, so we want clarity but we also don´t want consumers to know too much to preserve our name. Another challenge I can think of is that certain governments such as India might not want this passport as it might hurt the economy and won´t cooperate. Pakistan, which is one of our big suppliers, protects the local economy by contracting other Pakistani suppliers. If they let countries like China in, they won´t be able to compete.

Diving into less developed countries such as China and India, I see how supply chain transparency might be complicated. Tracing local market purchases for instance will be a real challenge. Carrefour has contracts with suppliers, who have contract with leather, buttons, packaging suppliers and those suppliers have contracts with other. It is a vast supply chain with many parties involved. This to say that implementing a DPP in garments by 2030 will be a significant challenge.

I05 - Positive Materials

My company is basically a network between brands and consumers. The DPP is a tool that I have discussed quite extensively within the company, and I know some people that are already implementing it in their own companies and working on its development. Interestingly, there is someone at EON fashion that is working on a non-removable tag for the DPP.

I believe that the waste hierarchy must be tracked. Therefore, a major advantage of the DPP is the fact that anyone can know the information. There are two big problems in the fashion industry, one is traceability, and the other is recyclability.

When it comes to the DPP, these data points that will be present are crucial. If the products is already sustainable then not too much is going to change with the adoption of the tool. Supply chains in the fashion industry are extremely complex and confusing. The purpose of the DPP is transparency, therefore, I am hoping that supply chains come away from the shadows and the secretive mindset and that the competitive data becomes a motivation for companies. I am also hoping that it becomes a tool to educate people, make them see the true impact of this harmful industry and persuade them to choose fewer damaging options.

In terms of requirements, I am hoping to be able to trust the information present on the DPP, I would like to see as much technical information as possible. I would also see more technology and blockchain, the more the better. As well explanations as to what regenerative cotton is for instance, and why is it better than other options or comparative information, to be able to compare the product I want to buy with others. This to say that information should have context – reformation.

Overall, I want to see knowledge that has influence, what we see now is extremely vague and misleading most of times. I do not to make consumers feel guilty, just to give them information to allow them to make responsible informed decisions.

I06 – Wageningen University & Research

The DPP is without a doubt a promising tool aimed at providing a comprehensive overview of a products lifecycle particularly in the context of sustainable textiles. However, we have yet to find a clear definition of what sustainable textile are, as this is complex concept. There is a concern that some in the industry may use it as a façade to appear sustainable without making substantial changes. The current focus on recycling is noted, but I believe that tool should encompass a broader range of topics, such as the exploration of fossil-free textiles.

In terms of potential impact, the DPP could drive the textile industry towards more sustainable and environmentally friendly practices. However, the effectiveness of the DPP relies on accuracy of data, which is currently extremely limited. Furthermore, socially the tool might encourage consumers to make more informed decisions. The EU is aiming to nudge consumers to a certain, more sustainable direction. Yet, without proper data, its impact on these aspects remains constrained. Implementation challenges include a reluctance to share data and the overall effectiveness of the tool. The industry is struggling, but I see potential for positive change if the right, drastic steps are taken.

Furthermore, it certainly has the potential to influence the supply chain positively, provided it is effectively use, and data is accurate. Transparency is a crucial aspect and the DPP could shed light on various steps in the value chain. However, again, the effectiveness of the DPP depends on the accuracy of data.

Ideally, the DPP should cover end-of-life considerations, materials (beyond just fibres) and the origin of the product, especially concerning carbon emissions. These requirements are essential for consumers to make informed choices.

In the short term, we may not see immediate benefits. However, in the long run, the DPP could enhance our company image, especially in regions like France where some companies are already leveraging similar tools for positive branding. I believe the key lies in fostering transparency and improving recycling practices. Overall, the textiles industry is highly creative when they need to change, they do.

I07 - Ford Motor Company

Ford is working with the traceability of raw materials, gaining abetter understanding of where, they come from. Looking into the mines from lithium is extracted for instance and the workers conditions, however, this is a challenge.

There is an issue when it comes to end-of-life practices, only 85% of contents from batteries can be reused and recycled. However, raw materials are like gold, it would be a waste not to recycle it. We want to be able to increase the recyclability value to be able to put it on other vehicles. Batteries are complex systems of cells, therefore, to see care instructions, allowing them to last longer would be a major plus.

In terms of the DPP, I do not know the full scope, however from a brand perspective, I believe it could be extremely positive for brand loyalty. For the automotive industry, sustainability is not a number one priority, consumers number one priority right is the choice between electric vehicles (EV) or combustion ones. The second priority, if they choose EV is where do they charge it. Sustainability is a number one consideration in theoretical terms but not so much on practical terms.

I see various challenges with the DPP, but the main one will certainly be traceability for us, especially with the parts that come from places like China. Once consumers order cars, we completely lose track of them, so information gets lost with the consumer. Another aspect is that we do not always know who our suppliers are with the DPP I'm guessing it become a lot simpler, as supplier can be found in the system.

In terms of requirements, I feel like a logbook where you can see the journey of your second-hand car would be useful. However, tracing all the cars components would be an exceedingly difficult task. While in fashion there are still several components, in the automotive industry, there are even more. Our partners and suppliers do not have full traceability; however, I believe we are in decent shape as they are constantly on the look for new legislation in advance. I am currently working on releasing infographics on the website with the percentage of recycled content as well as sustainability considerations of the vehicles, for consumers to be able to access and explore it.

Currently we are working with embodied carbon emissions scope 1,2 and 3 which hopefully consumers will be able to easily have access to. In 2035 we must reach carbon neutrality, as so there are many people already working in areas such as sustainability engineering, legislation and get more information across to the consumer. Personally, I deeply value authenticity, and the ability to make up the claims we make, I have been saying this for a while for 2024 is going to be the year of make-do.

I08- European Commission

1. What is the current state of the DPP, and how is the implementation process progressing?
2. In your opinion, what are the biggest economic, social, and environmental benefits?
3. How about the major barriers and challenges of DPP implementation?
4. In terms of product ecological footprint, do see the DPP having a significant impact in this aspect?
5. How do you foresee the DPP impacting supply and value chains in the fashion industry, particularly concerning transparency and sustainability?
6. What kind of requirements do you expect to see in the passport?
7. And now, what are the next steps?

DPP is a proposal from the Ecodesign, which will soon be implemented. In March 2022, the commission adopted the textiles strategy. It is all about addressing the ever-growing climate and environmental impact of textiles. An assessment showed that the textile industry is the most impactful section, the third in land and water use, and the projections were that if we did nothing it will grow exponentially, notably linked to the phenomenon of fast fashion.

The textile strategy which has a number of initiatives is 3-fold:

1. Non regulatory, soft law initiatives such as outreach campaigns towards consumers and company, awareness campaigns, the transition pathway to produce a number of actions for achieving greener and digital transitions for the whole ecosystem). Colleagues of mine are collecting commitments from the industry to go beyond the regulatory minimum in a number of fields including social and environmental sustainability.
2. The funding part which is all about helping the industry adapt to these new regulations that are coming as well as this new reality. It helps them become greener and more digital above

and beyond the regulatory minimum. The big source of funding the rise in Europe, first time we have funding for textiles.

3. The two aspects above are linked to the DPP as they are meant to help the industry implement and make full use of the DPP. The last aspect is regulatory, is sometimes called regulatory shock. The sector is minimally regulated on a specific basis at EU law.

We are introducing legislations according to 3 pillars of intervention (not a formal classification, it is used in our office to help companies and academia to understand what's coming)

1. Product legislation – which will introduce rules on the characteristics of products and what obligations companies will have to comply to place them on the market.
2. Consumer information – conveying to consumers information that help them make proper choices when purchasing and using textile products.
3. Sustainability - Global pillar, not limited to the boundaries of the EU which includes environmental and social sustainability. It all about the CSRD, forced labour legislation.

The first two pillars are very linked by ESPR with DPP being its implementing tool. Ecodesign is a framework regulation which applies to all products. We are now going to introduce specific requirements for the several types of products including textiles products by a delegated act, which is already being prepared. Not only for the architecture of the DPP itself, in technological terms nut also the actual requirements that product will have to comply with to be introduced in the EU market. The idea of Eco design is to make textile products more sustainable, as an approach for the whole lifecycle.

Right now, we are focusing on the supply chain. Looking into product aspects, these are dimensions of environmental aspects to characterize products, such as durability, recycled content, recyclability (which are the three we are focusing the most, but also carbon footprint, microplastics,). We want to introduce two types of requirements: information and performance. Information aims to create a harmonized based of criteria to characterize how green products are. First of all, we are going to define which product aspects are relevant for textiles (focus on durability, recyclability, and recycled content), then for each product aspect we are going to define which are the relevant parameters (e.g. a key parameter for durability is colour fastness in the use phase, so in the washing). For color fastness the idea is to say, when you place a product on the market, you need to put in the DPP information about how much color fades after an 'x' amount of washes. If we want to make it a performance requirement it's a minimum threshold below which a product cannot go otherwise, they will be banned from the EU market. If your product loses an x amount of colour after an x amount of washes it cannot be placed on the market, meaning that the product is subjected either do the testing or assure in any other way that the product does not loose that amount.

The requirements will be in the delegated act.

There is a 3-step ladder for Ecodesign product aspects:

1. Select which ones are more relevant for textiles.
2. Which do we have enough standards, literature, research, testing methods already available to substantiate these rules characterizing the product.
3. They will then decide which parameters are relevant such as colour fastness, loosing buttons, recyclability parameter - is it easy to separate components parts to then use them for recycling? Recycled content – how much of the present fibres are recycled and what kind of recycling.

This is why we are not focusing on all product aspects at once, we are focusing on durability, recyclability, and recycled content. Immensely complex. The scope of eco design will not necessarily be for all textile product it is still to be defined, we are focusing on apparel and accessories.

The DPP is an electronic repository of information, and it will not be developed by the commission, companies will develop it themselves. We will provide the technical standards such as the language, the IT specifications to make them interoperable. These DPPs are the manner to convey to three groups of recipients. It will also be used on webpages, digital labels.

1. The companies themselves, because information on the product is relevant for other companies, but more importantly for companies involved in production. The SC in the textile industry is very autonomized, there is little consolidation, 99% are SMEs, there is very little vertical integration, and it is scattered around the world. You have SC that involve very small economic players, all around the world, in order to come up with the information to then put on the DPP, characterizing the products according to the product aspects, you will need information from the SC. DPP will be a tool for companies themselves to know what the characteristics of the products is, all this info will become available.
2. A segment of that information will then go to market surveillance authorities, these will receive a subset of information. This is due to privileged information and IT restrictions. This will enable them to check whether products comply with the regulation.
3. Consumers – they will receive an even smaller subset of information because the information is public.

The DPP will be an enforcement tool but also a consumer information tool. Because the DPP will contain large sways of information, we are thinking about developing a label to in a way summarize and characterize the information in terms of their sustainability and circularity.

To access the information, there will be a data carrier, which in placed on the physical label of clothes. The technology is not yet decided, there is an open public consultation. It can be a QR code, NFRD, NFC, so that people using their smartphones can access this information online. The idea is that people use this before they make their purchasing decisions but also later on how to care for them longer, last longer, less microplastic, less energy while washing, harmonize size, to boost the second-hand market (to more easily circulate), rules to the 'made in' statements (carbon footprint link to it). This will allow for authorities but also for the consumers and companies to properly understand their products.

There are two more remits of action linked to the eco design:

1. Waste – revision of the waste framework directive – EPR. Because the EPR scheme involves producers paying for the proper management of products, you will pay more if your product scores less environmentally friendly and less if the opposite happens.
2. Market surveillance – One the enforcement side, we have the biggest revision of customs legislation. To make sure that product coming into the EU comply with the rules, super important especially for the online world. Production lines will fully need to comply to EU rules no matter where they are if they want to be sold in the EU market. The EU wants to be environmental champions and setting the right example, what we hope will happen is that same thing that happened with the universal chargers, where apple opposed it but had to then comply with it, but only for the EU. To have two production lines, one for the EU and one for the rest of the world is extremely expensive. We hope that EU standard will become the global standard since we are one of the three biggest markets. Companies need to be

aware of the rules, have the capacity to implement them (some funding is available to help this transition), market surveillance will actually comply with the rules, or will it be free for all? The EU cannot test every product. But technical documentation will be required, rules will be drafted, conformity procedures.

Social sustainability (absence of child labour, minimum wages, forced labour) is not a part of Ecodesign, therefore it will not be in the DPP. Part of the corporate sustainability due diligence. Large and medium companies for textiles will have to demonstrate via reporting that they have internal corporate due diligences policies to make sure that certain social sustainability measures are met.

The idea is to make textile labelling a meeting point of all these pieces of legislation on the textile strategy. We need to properly inform consumers before and even after of all the characteristics of the textile product even beyond the environmental aspects to include social sustainability, animal welfare. The DPP is limited to sustainability and circularity – environmental aspects. Whether we are going to have linked to it care, social, made in labelling is still being debated.

Sensitive data

Companies own and manage information since the DPP is developed by them. The commission is not going to do it centrally, so in a way it is an assurance that the information will be kept secluded under their domain. However, by requiring so much information to properly characterize the products notably on sustainability and circularity, inevitably there will be bits of information which companies consider sensitive. There will be cases of a conflict between the need of companies to keep privileged information secret and the overriding public interest of making that information public. I cannot guarantee that everyone will be satisfied.

Fast fashion cannot be banned, we cannot ban a business model. What will happen is by requiring minimum performance in terms of sustainability and circularity, certain business models or strategies which we may characterize as fast fashion, will become either illegal, because the products they want to place in the market do not meet the minimum or they will become unprofitable. Nowadays, it is quite easy to produce cheap, highly polluting clothes as there are no rules establishing a minimum below which you cannot go. It will become too expensive to produce at that huge rate and the huge amount they produce. But we will not ban these business models, they will have to redesign them to accommodate these new requirements. The expectation is that FF will become environmentally and economically unsustainable in its most extreme dimension.

Ban on unsold goods – landfill or incineration is the worse possible outcome to clothing items; these clothes have never been used and are completely fit for purpose.

Challenges

1. Major challenge - Proper implementation by companies, we need to explain that they are the ones who will need to develop the infrastructure and they need to put it into place according to certain standards requested by the Commission. It will be challenging in terms of costs but not insurmountable, they need to start preparing.
2. Particularly challenging - The information within the DPP, stakeholders need to start assembling already a network of information exchange across the SC, because this does not exist. Companies nowadays have no idea who most of their suppliers are. They do not need to know their whole SC but the key points of the SC they will need to know, depending on the requirements we are going to introduce. And these information exchanges across the supply chain need to be set up now. This will indeed be particularly challenging for SMEs but

it is also challenging for bigger companies, as they do not control the whole SC and they don't control what suppliers working exclusively for them do.

3. Ultimate challenge – properly and accurately implement the exact Ecodesign requirements we are putting in place. This they can only prepare once they know them, this is also why its also important to allow a transition period long enough to prepare. This will also have large costs; they will not only need to get the information that is required but also meet the performance requirement minimums that we are going to establish.

DPP - Exceptionally large repository of information, it will be pages and pages. 0.1% of people will read that before making the purchase decision. This is why we feel labels are so important because labels by definition are all about consumer information. We are thinking about introducing a label to characterize a product. We want to produce a score or scale for each of the various dimensions of Ecodesign. We aim to make a clear label stating on durability, it scores A-F, green red. We want to see if we have support from the stakeholders.

Consumers information, a scale of the relative importance of a certain environmental aspect, stating that a clothing item was made using X litres of waters will not be clear to every consumer.

Washing machines scale are only energy use and energy efficiency. Cannot do a compounded, overall environmental score, it is difficult to achieve. The idea is to ban overall scores as per the green claims' directive, it would be misleading and not scientifically sound.

With this tool there is no more misleading of consumers, greenwashing, so companies will be competing under the same set of rules and companies. At the same time, by banning the super low performing we are also enhancing the European industry, normally we score a bit higher. The super low and super polluting productions come from developing countries. There are also a lot of business opportunities, the more advanced, more environmental products normally have a higher profit.

2. The Questionnaire

2.1 Questions

1) Please state if you agree with the following statement: "I give permission for my answers to be analysed and used for research purposes".
   - I agree
   - I disagree

2) What is your age?
   - 18 our younger
   - 19 to 28
   - 29 to 38
   - 39 to 49
   - 49 to 58
   - 59 or older

3) What is your gender?
   - Male
   - Female
   - Non-binary
   - Prefer not to say

4) In which country do you currently reside?

5) What is your highest level of education?

   - Bachelor´s degree
   - High school degree or equivalent
   - Master´s degree or higher

6) How familiar are you with scanning QR codes on your mobile phone (e.g., like the ones we see in restaurant menus).
   - Not very familiar
   - Somewhat familiar
   - Very familiar

7) Are you aware of the Digital Product Passport concept?
   - Yes
   - No

8) Since you chose no, here is a short description of the concept: A Digital Product Passport (DPP) will allow consumers to scan a QR code on a label and obtain information about a product's entire lifecycle. This will include information regarding the material composition, production methods, ethical concerns, and environmental

impact of the products we purchase. It aims to help consumers be more informed and make more sustainable choices.

9) How important is it for you to make sustainable choices when purchasing clothing products?

    - Extremely important
    - Moderately important
    - Not at all important
    - Slightly important
    - Very important

10) Can you recall any instances where the information provided on the product label, for example, "100% natural" or "made from recycled materials", didn't seem accurate or felt misleading during a purchase?
    - No
    - Somewhat
    - Yes

11) State whether you agree or disagree with the following statement: "Having access to a Digital Product Passport would positively impact my ability to make sustainable choices when purchasing clothing products".

    - Agree
    - Disagree
    - Neutral
    - Strongly agree
    - Strongly disagree

12) What information would you like to see present on the Digital Product Passport that would impact your purchasing decisions? Please select all that apply.
    - Material composition (e.g. fabric)
    - Ethical manufacturing practices (underpaid workers, gender pay gap…)
    - Care instructions, reparations and washing information
    - Supply chain transparency (Details about the product´s journey)
    - Product durability and longevity
    - Carbon footprint
    - End lifecycle information (redesign, reuse, recycle...)
    - Water usage
    - Energy source/consumption
    - User reviews
    - Other

13) Are you interested in certification marks of your clothing products in the Digital Product Passport (ethical, fair trade, eco-friendly)?
    - Neutral

- No
- Yes

14) Say, the Digital Product Passport you scanned has all the information you are looking for, if you come to the conclusion that maybe that product or brand you like does not meet your criteria, what would your next step be?
    - Ignore it and buy the product anyway
    - Not buy from this brand entirely
    - Not buy this product but still buy from the brand

15) From the list below, which best describes your future utilization of the Digital Product Passport concept?

    - I don't see any reason for using this
    - I might use it for some products but not for every single one
    - I will definitely use it in every purchase
    - I will likely use it

16) Please provide any additional comments or suggestions regarding the sustainability of the fashion industry and/or its implementation of the Digital Product Passport.

2.2 Demographic Analysis

Table 9: Respondents demographic overview

	Count	Percentage
Age		
18 years or younger	2	2%
19 to 28	52	43%
29 to 38	6	5%
39 to 48	22	18%
49 to 58	32	27%
59 or older	6	5%
Gender		
Female	74	62%
Male	46	38%
Countries		
Austria	1	1%
Belgium	4	3%
France	3	3%
Germany	7	6%
Ireland	2	2%
Netherlands	24	20%
Portugal	68	57%
South Africa	1	1%
Spain	3	3%
United Arab Emirates	2	2%
United Kingdom of Great Britain and Northern Ireland	4	3%
United States of America	1	1%
Education		
Bachelor´s degree	47	39%
High school degree or equivalent	22	18%
ɜe or higher	51	43%
QR Code Familiarity		
Not very familiar	10	8%
Somewhat familiar	24	20%
Very familiar	86	72%
No	67	56%
Yes	53	44%

2.3 Descriptive Statistics Calculations

Sustainability Importance

Mean = $\sum \frac{Likert\ scale\ x\ Count\ of\ respondents}{Total\ respondents}$

Mean = $\frac{(5\times15)+(4\times38)+(3\times46)+(2\times20)+(1\times1)}{12} = \frac{75+152+138+40+1}{120} = \frac{406}{120}$

Mean≈3.38