

Louvain School of Management

Blockchain in the luxury sector:

What influences luxury consumers' willingness to use blockchain and how could it impact consumers' purchasing behaviour.

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Introduction

1. Context description

In the modern world, globalization and industrialization drove companies to delocalize production to areas with lower labour cost or to externalise activities. This has led to longer and more fragmented networks in order to cope with the increasing demand in consumption. This tremendous growth in consumption, started to raise questions regarding the impact it could have on the environment, as our day-to-day consumption is considered to be the greatest concern of modern times (Beckham & Voyer, 2014). Indeed, pollution, overpopulation and depletion of natural resources dramatically impact the environment, which has urged the need for people to start engaging and behaving environmentally friendly (Griskevicius, Tybur, & Van den Bergh, 2010). Damages of fast fashion on the environment, the working conditions in factories located in developing countries, and the sourcing problems in the cocoa and coffee industry, have already been discussed several times.

While the growth for ethical consumption tends to focus only on low value, commoditized products such as food, cosmetics and apparel, ethical concerns exist across every sector (Davies, Lee, & Ahonkhai, 2011). The luxury sector has therefore not escaped this “ethics era” we are witnessing in today’s world. And with good reason, as many scandals harming the environment have occurred in the past years. There are many examples, such as “blood diamonds”, a well-known problem in the diamond industry as diamonds are sourced and sold from war zones in order to fund military campaigns, or the contamination of drinking water due to the tanning or gold industry (Davies et al., 2011) or even the multiple issues related to fur and leather, including the scandal in 2015 of Hermès accused of barbaric slaughters of crocodiles for the famous Birkin Bag (Zielinski, 2015). These scandals affected not only luxury brands’ reputation but also consumers’ behaviour, as environmental and social impacts of the entire supply chain began to be considered in purchasing decisions (Davies et al., 2011).

As a consequence, luxury brands started to invest and take actions towards sustainability (e.g., ecological leather, ethical gold, recycled clothing, traceability of raw materials, improved

working conditions). Stella McCartney pioneered the path to synthetic leather, by refusing to source and use products from animals and therefore, proving that luxury and sustainability can be compatible (Novethic, 2017). Other major brands followed this trend. For instance, Gucci started banning furs, Hermès created a special collection called “petit h” reusing scraps of leather or silk from its creation to create small accessories such as key rings, and even Yves Saint Laurent launched a “New Vintage” collection using fabrics from previous seasons designs (Novethic, 2017). Despite these efforts, essential questions of traceability and transparency appear and need to be addressed in order to provide answers to questions such as “who made my clothes”, “who made this handbag” or “is this product environmentally, socially and ethically produced and sourced” that consumers begin to consider while purchasing luxury goods. (Davies et al., 2011). This increased sensitivity of luxury consumers towards sustainability issues, forces brands to incorporate traceability and transparency into their communication and strategies.

At the same time, technologies are constantly developing in order to address various issues modern companies are facing. One of these emerging technologies is blockchain, developed in 2009 along with the Bitcoin cryptocurrency. The tremendous potential of blockchain from public health to financial and luxury sectors, constitutes an exciting and interesting subject to study.

2. Research question

Extensive research, based on luxury sector and sustainability, exist among literature. Most of them strive to assess whether luxury and sustainability are two compatible concepts, and how luxury consumers perceive sustainability. Others analysis emphasized the need for transparency, which most consumers are now seeking. Besides that, there is a reasonable amount of literature about blockchain technology, the implementation of such a tool and the benefit it can bring (such as transparency). There is however, not a lot of sources that tackle the impact this tool could have on purchasing decisions in a particular sector, in this case luxury. Thus, the present study will provide and fill the gap in the literature by testing factors influencing luxury consumers’ willingness to use blockchain to increase transparency, as well as the effects this technology could have on their purchasing decisions.

Large luxury brands are convinced with the potential of blockchain in order to secure traceability in supply chains and the fight against fraud (Rouach, 2019). As a matter of fact, blockchain could also provide a solution to new markets' requirements in the luxury sectors, where consumers' behaviour and demands have evolved (Rouach, 2019). Sourcing origin, products' composition and manufacturing conditions have started to play an important role in the purchasing decisions of luxury consumers, more sensitive of the brands' ethics (Rouach, 2019). This reinforces the argument that a comprehensive insight of the factors influencing the use of blockchain for environmental purposes is needed in order to better understand the potential effects on purchasing behaviour. The purpose of this study is therefore to give acumen to luxury brands on what influences the need for transparency, and to prepare them for potential changes in behaviour.

Based on the defined purpose, the following question arises: *Blockchain in the luxury sector: Which factors influence luxury consumers' willingness to use blockchain and how could it impact consumer's purchasing behaviour?*

3. Disposition

To address the present research problem, the thesis will first guide the reader through a literature review, aimed at providing a relevant background on blockchain, and its integration into the luxury sector. Based on the literature review, the second part of this master thesis, consists of establishing a coherent methodology and strategy in order to collect primary data. Lastly, we will conclude this thesis by discussing the results of the practical analysis, its limits and the additional questions to be addressed in future research.

PART I: Literature Review

1. Blockchain

This first section aims at introducing the concept of blockchain giving a theoretical background on its mechanism as well as the benefits this tool could bring and the limits that are still preventing firms from adopting it.

1.1 Origins and definitions

1.1.1 Origins

As mentioned in an article from Deloitte (Grewal-Carr & Marshall, 2016), blockchain started with the appearance of Bitcoin cryptocurrency in 2009 by Satoshi Nakamoto, assumed to be a pseudonym. This cryptocurrency experiment has shown that it existed as a viable digital alternative to cash and other means of exchange in today's society (Grewal-Carr & Marshall, 2016).

Although blockchain is the mechanism behind Bitcoin that has allowed the emergence of this cryptocurrency, until recently, for a large number of people, blockchain only relates to Bitcoin (Wang, Singgih, Wang, & Rit, 2019). This issue has also been highlighted in an article from Deloitte (Grewal-Carr & Marshall, 2016), which explains that the focus on digital currencies has created a widespread misconception that has led to think that blockchains are relevant only in the banking sector.

Nevertheless, besides the fact that it is the underlying technology behind Bitcoin, several other applications can be foreseen, and since then other systems have been developed (PwC, n.d.).

1.1.2 Definitions

Several definitions of blockchain exist amongst literature. They are generally quite close to each other, although some authors emphasize specific aspects more than others.

The financial sector was the first to express an interest in blockchain and has legally enshrined this technology (Plisson, 2017). In her article, Plisson (2017) gives a definition of blockchain from the monetary and financial code (articles L.223-12 and L.223-13):

It is a “shared electronic recording device enabling authentication of these operations.” (as cited in Plisson, 2017, p.21).

In their paper, Venkatesh, Kang, Wang, Zhong, and Zhang (2020) emphasize the permanent tamper-proof record feature of blockchain. They define it as follows:

“Blockchain is a digital, decentralized, and disruptive innovation, in which transactions are recorded in chronological order with the objective of creating permanent and tamper-proof records.” (Venkatesh, Kang, Wang, Zhong, & Zhang 2020, p.2)

Another definition was given in the paper of Wang, Singgih, Wang, and Rit (2019). In this definition, they highlight the important sharing feature of the blockchain:

Blockchain technology [...] is essentially a peer-to-peer distributed asset database that can be shared across a network of multiple sites, geographies or institutions. The technology’s core innovation lies in its ability to publicly validate, record and distribute transactions in immutable, encrypted ledgers. (Wang et al., 2019, p.221).

The decentralized and distributed aspects of blockchain signifies that no centralized authority exists among users, but a peer-to-peer network of computer servers handled by decentralized owners (Helo & Hao, 2019).

Through its permanent tamper-proof record and the fact that blockchain is shared across a network of multiple sites, several authors have qualified it as being transparent because everyone can access it and verify its integrity at any time (Plisson, 2017).

1.1.3 Characteristics

Three main characteristics define the blockchain. First, blockchain is **consensus driven** which is an agreement among every computer within a network, helping to decentralize the network to authenticate and validate a transaction (Azzi, Chamoun, & Sokhn, 2019). It provides a guarantee that every node within the network shares the same data and prevents data manipulation from harmful actors (Azzi et al., 2019). This consensus enhances trust among users as information within blockchain is checked and verified by every user (Azzi et al., 2019). Secondly, **smart contracts** are used to execute the duration of a contract or procedure on each network's node (Azzi et al., 2019). Therefore, each node within a blockchain network must agree on the inputs, outputs and status impacted by the smart contract (Azzi et al., 2019). Finally, the last characteristic is the **cryptographic** technique used in order to ensure integrity, authenticity, immutability and nonrepudiation (Azzi et al., 2019). Several cryptographic techniques exist. Within the Bitcoin blockchain, a new transaction can only be added to the blockchain once a participant on the network solved a complex mathematical problem, called "proof-of-work" (Grewal-Carr & Marshall, 2016). Each block within the network is made-up of three components: the block header, a set of transactions and the metadata (Heister & Yuthas, 2020). It is the block header that enables the linkage of blocks within the chain. The block header contains three things: an algorithmically created cryptographic hash, a time stamp and the hash of the previous block thereby allowing the formation of the chain in a chronological manner (Heister & Yuthas, 2020).

In a video situated on the web page of the United Nations Global Compact (UN Global Compact, 2018), a table (Table 1) that summarizes the capabilities and the value proposition of blockchain was given:

Table 1: Capabilities and value proposition of blockchain (UN Global Compact, 2018)

Capabilities	Value proposition
• Distributed ledger • Decentralized • Immutable • Peer-to-peer direct transacting • Smart contracts	• Trust • Transparency • Verifiable Identity • Remove intermediaries • Accelerate processes • Execute contracts

Many articles indicate that blockchain technology can either be private, public or hybrid (Helo & Hao, 2019; Plisson, 2017). Private means that its access and use is limited to certain actors and no one can participate without being authorized to do so, but everyone can consult it (Helo & Hao, 2019; Plisson, 2017). On the contrary, public implies that it can be consulted and used by everyone (Helo & Hao, 2019; Plisson, 2017). The last type is hybrid, which is a combination of both private and public, the blockchain is under the control of a set of organizations in which the right of access can be open to all or limited to certain users (Helo & Hao, 2019; Plisson, 2017).

1.2 Mechanism of blockchain

1.2.1 Technical approach

This chapter is dedicated to the explanation of blockchain in order to better understand the way this technology works. To properly describe and explain its mechanism, blockchain operating process of Desplebin, Lux, and Petit (2019) was taken as reference. It is developed into five steps.

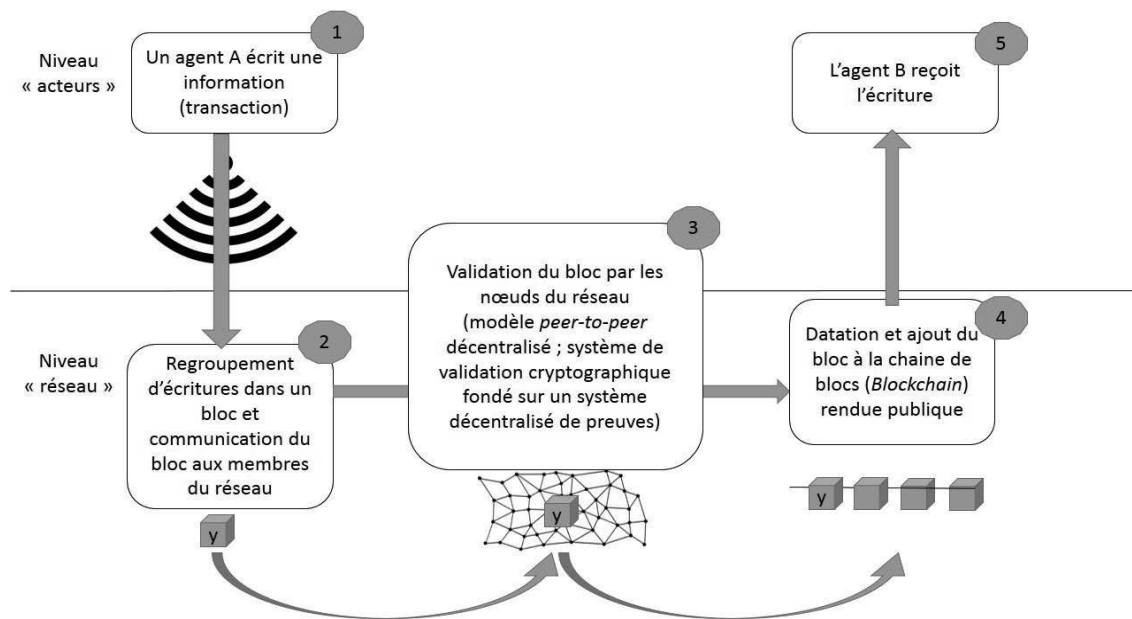


Figure 1: Blockchain operating process (Desplebin, Lux & Petit, 2019)

STEP 1: Agent A records a writing request to an agent B in the blockchain ledger (Desplebin, Lux, & Petit, 2019). Agent A uses a software for this registration that will forward the request to users, gathered in a network (Desplebin et al., 2019). The blockchain network is composed of several nodes maintaining a set of shared state and performing transactions that will update the states (Azzi et al., 2019). The writing of agent A is then added to an information block that brings together the writing requests entered into the registry by all users over a certain period of time (Desplebin et al., 2019).

STEP 2: This block is placed in the “queue”. The validation of the block within the blockchain will require validation by consensus of the network users (Desplebin et al., 2019). In order for the transaction to be ordered and packaged into a timestamped block, it first has to be validated by the majority of networks nodes (Azzi et al., 2019).

STEP 3: The next logical step is the validation. It is the key step of the blockchain technology (Desplebin et al., 2019). The cryptographic protocol allows a validation of the block information via the consent of the network users, called the minors (Desplebin et al., 2019). The purpose of these operations is to subsequently identify the blocks of information without revealing their content, which allows the integrity of the entries to be verified (Desplebin et al., 2019).

STEP 4: When the block is validated by the consensus of users, it is time-stamped and added to blockchain (Desplebin et al., 2019). This validation is irreversible. Indeed, the block is added in an orderly manner following the others within the registry (Desplebin et al., 2019). Moreover, each block contains information about the previous block making it impossible to modify a block without altering the entire downstream blockchain (Plisson, 2017).

STEP 5: Finally, this blockchain is made accessible by all network members who have the same copy of the information recorded within the blockchain (Desplebin et al., 2019).

1.2.2 Practical applications

An easy way to imagine the blockchain was given on the blockchain information web page of PwC: *“Imagine a very large notebook that everyone can read for free and freely, on which everyone can write, but which is impossible to erase and indestructible”* (PwC, n.d.).

As we have explained, the first sector that was attracted by this technology was the financial - banking sector. Several applications already exist in the financial sector, for instance BNP SmartAngels platform applied for private companies. However, the potential of blockchain is considerable. It can be applied to other sectors and more specifically, to every area involving exchange, a backup and the need for evidence could be impacted (Plisson, 2017).

Many sectors have therefore started to invest in blockchain, such as commerce or diploma certification. Indeed, blockchain could prove and ensure diploma authenticity (Plisson, 2017). Besides that, other applications are also gaining importance in different areas. In the field of insurance, blockchain could be used for the automation of policy underwriting, claims and compensation management (Plisson, 2017). Blockchain could also contribute in energy and sustainable development and ensure product certification of origin (Hammoud, Croog, Grewal & Plumb, 2019). Cultural enterprises are also interested in this technology, in particular for the management of copyrights (Renner, Fedder, & Upadhyaya, 2018; Plisson, 2017). Blockchain could also be applied for healthcare uses as it allows the storage of medical history for the patients and could make sure that medicines are not “fake” (Reiff, 2020).

Range of applications of the blockchain is very large and can be applied across many sectors. We will focus on its application within supply chains and for the luxury sector.

1.3 Benefits and limits of blockchain

1.3.1 Benefits of blockchain

Blockchain technology has gained interest in recent years through the benefits this technology could deliver. In an article from Deloitte (Renner Fedder, & Upadhyaya, 2018), it was said that global blockchain revenue will probably grow at a rate of 42.8% from 2017 to 2022. This article also emphasized the fact that blockchain could amongst other things, help the consumer products industry creating more value, achieve operational efficiencies through innovation and efficient internal process, and enhance consumer experience (Renner et al., 2018).

We have seen in section 1.1.3, the value proposition identified by the UN Global Compact (2018) by virtue of the characteristics of blockchain; **trust, transparency, verifiable identify, remove intermediaries, accelerate processes, execute contracts.**

Through its distributed ledger, updated and validated in real time for each transaction, it will enhance trust between stakeholders and especially between customers and suppliers (Azzi et al., 2019). Moreover, blockchain enables verifiable identity to know who is submitting information and then maintaining an audit and tracking history (United Nation [UN] Global Compact, 2018). Therefore, the blockchain will positively impact industries as it will allow individuals, organizations and machines to deal and transfer data with each other without having to trust or involve an expensive third-party verification (Wang et al., 2019). Venkatesh, et al. (2020) emphasized this benefit; as blockchain technology deployment provides a smart contract environment with an immutable public ledger to view every transaction and as it supports independent process monitoring from a global perspective, it allows the removal of inter-organizational barriers. In terms of process, the removal of intermediaries will allow companies to accelerate certain operations and thus, improve performance (UN Global, 2018).

Another major advantage identified, is that blockchain allows the construction of an effective traceability system, which will add profit to organizations' supply chains (Azzi et al., 2019). With the level of transparency, it provides, it will amongst other things, preserve the security

as every transaction is checked using public-private-key cryptography (Helo & Hao, 2019). Indeed, as explained in the mechanism of blockchain, all the recorded transactions on the blocks cannot be further modified once they are accepted (Helo & Hao, 2019). In the same way, it will be a significant tool to fight against fraud and corruption (Azzi et al., 2019).

In an article from the Boston Consulting Group (Hammoud, Croog, Grewal & Plumb, 2019), they stated that blockchain initiatives enclose several different categories with different value profiles. In our case, we will focus on provenance and supply chain tracking where key drivers of value are traceability and data immutability which allows the clarity on the origin of goods, transparency between players and real-time accurate information (Hammoud et al., 2019).

1.3.2 Limits of blockchain

Despite the many benefits and advantages that blockchain could deliver, there are also constraints to its development and implementation. Plisson (2017) identified in her article three levels of constraints that prevent the development of blockchain: technical limitations, legal uncertainty and cultural reluctance.

The most recurring limitation in the studied articles is primarily the lack of legal framework. Indeed, several studies mentioned the problem that no specific rights to blockchain exist except in some recent cases concerning the financial sector (Plisson, 2017). This was also emphasized by an article from the Boston Consulting Group (Hammoud, et al., 2019), explaining that the lack of regulations to blockchain is a major issue especially in sectors like financial services, health care or when multiple countries and jurisdictions are involved.

This last point leads to another limit to the development of blockchain; cultural constraint first at an international level, but also within the company itself. In order for blockchain to successfully be implemented, it requires cooperation among organizations (Deloitte, 2016). Indeed, in a paper, Boston Consulting Group (Hammoud et al., 2019) mentioned that another important challenge to the development of blockchain lies in what they called the “*coopetition paradox*”. This paradox queries industry peers to set aside their competitive differences and work together (Hammoud et al., 2019). When companies work together, that is where blockchain creates most value (Grewal-Carr & Marshall, 2016). The problem is that many

organizations started developing their own blockchain, and application to run them leading to several chains developed by many different organizations with many different standards, depending on each country, which can be less efficient than current applications (Grewal-Carr & Marshall, 2016). Within the company itself, blockchain will force organizations to think differently about the way they generate value (Grewal-Carr & Marshall, 2016). Indeed, blockchain represents a total shift from traditional practices as it has been estimated that blockchain is about 80% business process change for only 20% technology of implementation. (Grewal-Carr & Marshall, 2016).

A financial limit has also been raised in many papers. According to an article from Deloitte (Renner et al., 2018), blockchain implementation could take a medium- to long-term time frame in order to realise a return on investment as there is no supportive regulatory or legal framework and because rapid changes operate in technology (Renner et al., 2018).

Furthermore, one major concern about blockchain lies in the fact that it requires a great amount of energy as each computer on the network hosts a copy of the entire registry since its creation, and the registry is updated in real time (Plisson, 2017).

Finally, another important issue lies in the misunderstanding of the concept that may seem complex (Grewal-Carr & Marshall, 2016). Blockchain is still in the early stages of testing proof of concept and understanding where the greatest potential and profitability from blockchain lie (Hammoud et al., 2019).

2. Blockchain-based supply chain

After having discussed the blockchain, its mechanism, its benefits and limits, and its application in general, this section will provide an in-depth analysis of the blockchain within supply chains. Therefore, it will start with a contextual setting of supply chains and the CSR issues linked to current supply chains before entering the blockchain-based supply chain subject.

2.1 Context

2.1.1 Supply chains definition

Supply chains have gained importance within companies and are more and more considered as being the strategic level of competitiveness (Guérin, Fredouet, & Lambert, 2014). This concept has been mainly introduced and defined in different studies.

For Azzi, Chamoun, and Sokhn (2019) supply chains are defined as followed:

“Supply chain is a system of organizations, people, activities, information and resources involved in moving a product or service from supplier to customer”. (Azzi et al., 2019, p.582)

According to Lambert (2014) supply chains need to be conceived as the alignment, the articulation of operations that brings products and services on the market. Therefore, the supply chains should be understood as the interface between physical and information flows from suppliers to final consumers (Guérin et al., 2014).

Helo and Hao (2019) in their paper have highlighted the fact that supply chain activities can be divided into two parts: upstream and downstream. The first one refers to all the activities that create the product or service such as the sourcing of raw material, the production process, etc. (Helo & Hao, 2019). While the downstream part starts when the product is ready to be on the market and is all about the selling process which includes sales, distribution and disposal (Helo & Hao, 2019).

2.1.2 Supply chains challenges

Industrialization and globalization have led to new strategic behaviours identified by Guérin, Fredouet, and Lambert (2014). First, companies can choose to externalize activities that they do not believe are adding value along the value chain (Guérin et al., 2014). A second observed practice is that firms are usually embedded in a cost reduction strategy which drives them to reduce workforce costs or plant rent by offshoring, benefiting from lower labour costs in Asia

or others Eastern countries (Guérin et al., 2014). These new movements have led to fragmented networks and new challenges (Guérin et al., 2014).

A first challenge identified by Azzi et al. (2019) is the complexity of present supply chains. Indeed, with offshoring and externalized activities, networks have become longer, and activities are operated in different geographical areas, leading to more complicated goods manufacturing because of the increased number of intermediaries between the producer and final consumer (Azzi et al., 2019).

These longer networks with many intermediaries lead to another challenge. Although, Helo and Hao, 2019 emphasize the fact that supply chains aimed at establishing a multi-stakeholder collaboration environment characterized by mutual trust and a growing connection between firms, Wang et al.(2019) have identified that within existing channels, trust among suppliers' actors is low due to a lack of transparency and visibility. Because of this low level of transparency, most stakeholders trouble to have an overview on every transaction and tracking of a product journey (Helo & Hao, 2019). The two most affected stakeholders are customers and suppliers who only access a small part of the supply chain information (Helo & Hao, 2019).

Recent sourcing and supplying scandals have triggered an increasingly high demand for more visibility and transparency, which have strengthened the necessity for traceability remaining the main challenge in the supply chain (Azzi et al., 2019; Montecchi, Plangger & Etter, 2019).

2.2 Introduction to CSR

2.2.1 Definition and context

The European Commission (n.d.) has defined Corporate Social Responsibility (CSR) as followed:

“Responsibility of enterprises for their impact on society. Therefore, it should be company led. Companies can become socially responsible by integrating social, environmental, ethical, consumers and human rights concerns into their business strategy and operations” (What is CSR, para. 1).

CSR refers to the idea that businesses should not only be profit-oriented but also have responsibility beyond it as their activities affect the entire society (Keinan, Crener, & Goor, 2020). Many theories have been developed since the emergence of the CSR concept. The triple bottom line theory was proposed in 1997 by John Elkington, and focuses on three dimensions: planet, people and profit (3Ps) (Lemus, 2016). As an echo to that theory, the pillars of sustainability have also been identified in 2005 by the World Summit that defined three pillars that would support sustainability; environmental, social and economic (Lemus, 2016). These three pillars are said to be effective and efficient in a company's financial decision-making and if not taken into account, a company would not be likely to survive (Lemus, 2016).

The notion of CSR has led managers to rethink the development of strategy by incorporating environmental and social objectives with specific goals and actions into traditional economic objectives (Barin-Cruz, Chebbi, & Chtourou, 2011). This has obliged managers to deal with a constant paradox, that is, to develop strategies that take into account environmental and social concerns while concurrently guaranteeing sufficient levels of profitability for shareholders (Barin-Cruz et al., 2011). This new way of doing business has led to new business models incorporating those three pillars, redesigning model business according to it (Sparviero, 2019).

The importance of CSR has grown and become a major concern as it is shown in different surveys. In the KPMG Survey of Corporate Responsibility (Blasco & King, 2017), it was stated that *“more than three quarters of the world's largest 250 companies now include at least some “non-financial” information in their annual financial reports”* (Blasco & King, 2017, p.6). Another survey showed that 95% of the largest 250 companies in the global market issued CSR reports and follow CSR compliance guidelines (Lemus, 2016).

2.2.2 CSR and supply chains

As we have seen in section 2.1.2, developing countries with emerging market economy have become a hub for international business (Tumpa et al., 2019). However, industrialization and the extensive supply chains of multinational companies caused damages to the natural environment and human systems (Kusi- Sarpong, Sarkis, & Wang, 2016).

Therefore, in his paper, Sarkis (2003) identified the different activities within supply chains requiring particular attention to integrate social and environmental practices summarized in the table below:

Table 2: Activities requiring social and environmental practices (Sarkis, 2003)

Procurement	<u>Selection of suppliers</u>: taking into account the social aspect. <u>Procurement of materials</u>: recycled, reusable and harmlessly extracted.
Distribution & Process	Firms are sourcing and manufacturing in other countries, goods need to be transported from various origin to many sources leading to pollution issues as well as social ones.
Packaging	All features in this activity such as size, shape and materials have an impact on distribution due to their effect on transport characteristics. Better packaging can reduce material usage, increase space utilization in the warehouse and in the trailer, and reduce the amount of handling required.

In their study, Seles, de Sousa Jabbour, Jabbour & Dangelico (2016), identified the different stakeholders that exert environmental pressure on companies: consumers, competitors, the communities and the government. Among them, consumers are considered to be the stakeholders that yield the strongest environmental pressure on organizations as they are exerting the principal demand for environmental practices (Seles, de Sousa Jabbour, Jabbour, & Dangelico, 2016).

Challenges usually occur at the purchasing level because as CSR practices are usually confined to the boundaries of the companies and neglect interaction with stakeholders by only focusing on their internal activities (Commission of the European Communities, 2001; Frigant, 2015; Moretto et al., 2018). Indeed, Gupta, Soni & Kumar (2019) emphasized the fact that organizations are usually embedded in their activities while they should go beyond their boundaries and pay attention to suppliers' performance. This challenge lies in the lack of collaboration among stakeholders. Collaboration could enable companies to develop valuable, rare and difficult to imitate resources leading to a competitive advantage (Karaosman, Perry, Brun, & Morales-Alonso, 2018).

2.2.3 Transparency along supply chains

This chapter aims at discussing one of the challenges of current supply chains which is the lack of transparency. We have seen that global supply chains encounter many challenges with the most important one being the lack of transparency, making it impossible to verify whether the working environment is healthy and safe (Venkatesh et al., 2020).

Due to many incidents that have occurred in the past year during the production or manufacturing process, the reliability of supply chains as well as its product data accuracy were ultimately questioned. Nowadays, demand for transparency is increasing as consumers start to pay attention to the product they use every day and know very little about it (Azzi et al., 2019; Montecchi et al., 2019). In addition, the proliferation of technology (mobile devices, social media, etc.) has strengthened the need for transparency as upstream risks within supply chains have been brought up much closer to eyes, ears and voices of downstream stakeholders such as consumers, NGOs, etc. (Deloitte, 2014). Nevertheless, despite this growing demand, transparency and traceability along supply chains seem to still be a challenge for many brands (Montecchi et al., 2019). Several survey and papers demonstrated the lack of transparency as well as traceability. Indeed, a study conducted by Ecovadis and NYU | Stern (2019) showed that still 28% of the 399 firms interviewed have no visibility at all into their supply chains. In one of their publications, PwC also showed the poor knowledge of business about their supply chains; 40% of firms have limited or no visibility at all on their service activities (PwC, n.d.).

The low level of transparency affected consumers purchasing decisions. Azzi et al. (2019) mentioned the challenge for consumers being unable to verify the integrity of the product acquired due to deficiency in actual supply chains about product information such as its origin, processing and shipping journey. In their study, Montecchi, Plangger & Etter, 2019 added that with this low level of transparency, consumers are purchasing products being unaware of their exact origin, processing and shipping journey. This asymmetric or hidden information negatively affects consumers' purchase decisions, as they might perceive a risk (Montecchi et al., 2019). Although many firms have started to invest in transparency initiatives in order to address this lack of knowledge, the disclosed information did not reveal enough about where the value is added to a product along the supply chain or information regarding the product origin and flow throughout the stream (Montecchi et al., 2019). Therefore, consumers only rely on cues to appraise the tangible and symbolic values of products (country of origins labels,

certifications, etc.) but lack real knowledge about product's origin (Montecchi et al., 2019). As a result, consumers can perceive risks when they feel that product's information has been withheld and this risk will impact the consumers' purchase decision (Montecchi et al., 2019). For instance, information missing about the products' provenance raises consumers' perceived risks of negative outcomes (Montecchi et al., 2019). Another article emphasized the importance of transparency within global supply chains for consumers. Indeed, transparency could serve consumers in their purchasing process by making informed choices about the products they purchase (Gardner et al. 2019).

Solutions have already been brought up as for instance, in its report, the UN Global Compact (2014), brought up the importance of product traceability as a way to enhance transparency along supply chains, and thereby sustainable practices. Traceability as defined by the UN Global Compact (2014) is:

“the ability to identify and trace the history, the distribution, location and application of products, parts and materials, to ensure the reliability of sustainability claims, in the areas of human rights, labour (including health and safety), the environment and anti-corruption” (UN Global Compact, 2014, p.6).

The UN Global Compact (2014) characterized traceability as an *“invaluable tool for driving tremendous progress to improve the sustainability of raw materials” (Un Global Compact, 2014, p.7)*. To ensure traceability along supply chains, a system is required that will record and follow the product during its journey, from suppliers to end-customers (UN Global Compact, 2014). At the end, such a system could ensure three things: product quality, safety and labelling.

As multiple stakeholders including brand owners, retailers, and non-governmental organizations (NGOs) struggle to monitor and control sustainability problems in global supply chains, there is an increasing need for systems that would improve supply chain transparency, traceability and information exchanges among stakeholders in order to manage social sustainability more effectively to enhance compliance and build a better trusted environment (Venkatesh et al., 2020). Venkatesh et al. (2020) identified a possible technology that would solve these issues; the blockchain. This technology can bring supply chain transparency to a new level and expose negative practices such as child labour, upstream in the manufacturing process and the unethical use of rainforest resource (Venkatesh et al., 2020).

2.3 Implementation of blockchain-based supply chain

2.3.1 Context

We have seen in previous sections that still many challenges lie in supply chains, sometimes preventing firms to fully apply sustainable practices due to the lack of transparency. Therefore, a tool such as blockchain could enhance transparency and therefore highlight sustainable practices along supply chains.

Implementing a blockchain-based supply chain is appropriate in situations where consumers are lacking provenance knowledge and when there is an information asymmetry between customers and firms due to physical distances (Montecchi et al., 2019).

2.3.2 Benefits of a blockchain-based supply chain

Blockchain applied within supply chains' networks could have significant positive impacts for companies and enhances consumers purchasing decision.

Financially, blockchain offers advantages for companies. Indeed, the disintermediation feature of the blockchain reduces the need to use a third-party and therefore reduces costs (Azzi et al., 2019; Wang et al., 2019). In the same way, it accelerates the data transfer between parties making it possible to achieve greater efficiency in logistics and supply chains; cost reduction, quality and speed improvement, risk reduction and enhance sustainability and flexibility (Helo & Hao, 2019; Wang et al., 2019).

A major benefit identified by many authors is the possibility of tracing and having a higher visibility along the supply chain, allowing on the one hand to identify risks, protect from fraud and corruption for companies, but also allowing consumers to have enough information regarding the product they acquire (Azzi et al., 2019). By using this technology blocks could be created at each transaction starting from the manufacturer of a product to its distribution and sale, which is essential to ensure the traceability of the product as well as its authenticity and legitimacy (Azzi et al., 2019). Therefore, such disclosure and visibility ensure a reliable trace of a product's footprint which is particularly appealing for industries where the origin of a

product is essential and plays a major role in the consumers' purchasing decision (Wang et al., 2019). This could lead to a competitive advantage for firms as this level of transparency and traceability through blockchain could add value to supply chains by addressing the actual challenges such as the demand from consumers for product origin (Montecchi et al., 2019; Wang et al., 2019).

2.3.3 Limits of a blockchain-based supply chain

Wang et al. (2019) in their paper, identified three hindrances. The first one concerns the costs. Indeed, implementing such a technology entails significant costs (Wang et al., 2019). Secondly, firms may face some technical complexities when building a blockchain-based supply chain. Then, cultural misgivings and collaboration issues of this technology could also negatively affect the incorporation, as every stakeholder will have to agree and collaborate. Another barrier to the application of a blockchain technology is a legal barrier. Indeed, for the moment there are no blockchain-specific rights (Plisson, 2017).

Other barriers have also been detected by Montecchi et al. (2019) due to the level of transparency. Indeed, this level of visibility would definitely benefit consumers seeking for more information and authenticity but might prevent firms from implementing it. Inter-organizational barriers can be removed through blockchain technology deployment as it provides a smart contract environment with an immutable public ledger to view every transaction and supports independent process monitoring from a global perspective (Venkatesh et al., 2020). Therefore, some firms are hesitant to be more transparent because increasing the exposure of the firm also includes actors such as competitors and other organizations which could not access any information in the traditional supply chain (Montecchi et al., 2019). By consequence, firms could risk trade secret, intellectual property or supply chain details (Montecchi et al., 2019).

3. The luxury's sector

After having discussed about the blockchain and its application within supply chains, this chapter aims at providing a theoretical background on the luxury sector, its industries, its

relationship to sustainability and the current application of blockchain within this particular sector.

3.1 Introduction to luxury

3.1.1 Origins

Modern industry of luxury goods was born in the 19th century in Europe with entrepreneurs that were willing to establish companies aimed at creating exceptional products that would represent the elitist lifestyle of the time (Brun et al., 2018). It was once known as a quiet industry driven by product excellence and managed by families (Kernstock, Brexendorf & Powell, 2017). The value proposition of luxury was made-up of different elements; a mix of high-quality products, brand heritage, unique knowledge, exclusivity, personalisation of services and tailor-made communication, merged with long-term relationships with selected clientele ranked according to high prices and prestigious physical stores (Kernstock et al., 2017).

This value proposition is still true and relevant for the luxury industry however, nowadays, much of the industry is conducted by large conglomerates (e.g., LVMH, Kering Group, Coty) (Kernstock et al., 2017).

3.1.2 Definitions

There is not really an all-encompassing definition of luxury brand in the literature as the meaning of luxury is complex and can have more than one meaning depending on the context (Kernstock et al., 2017). Kapferer (2017) in its book mentioned the difficulty of defining the word luxury as *“it is at once a concept (a category), a subjective impression and a polemical term, often subjected to moral criticism.”* (Kapferer, 2017, p.236). The subjectivity issue has also been mentioned in the Kapferer & Denizeau (2017) paper emphasizing the fact that the major problem in measuring and defining luxury lies in its subjective character. Indeed, *“what is luxury for some, is just ordinary for others”* (Kapferer, 2017, p.236). Defining what a luxury brand represents is quite complex because luxury is a relative concept and the perception of

what constitutes “luxury” has fluctuated over time which makes it even more difficult to find a definition (Ko, Costello, & Taylor, 2019).

Therefore, different luxury definitions exist among authors depending on the perception and context but even though they may differ from one to another, they are still certain “codes of luxury” that are consistent across literature. A definition of a luxury brand and luxury goods will be given below based on the respective reference.

The literature largely defines luxury brand based on consumer perceptions and/or managerially determined dimensions such as marketing activities and product attributes (Ko et al., 2019). The only commonality in this panel of definitions is that they use multiple dimensions (one to ten) in order to properly define a luxury brand (Ko et al., 2019). Ko, Costello, & Taylor, (2019) identified those dimensions that were the most used to describe a luxury brand as **high quality, rarity, premium pricing** and a **high level of aesthetics**. Therefore, Ko et al. (2019) came up with a definition that includes the characteristics above:

A luxury brand is a branded product or service that consumers perceive to: be high quality; offer authentic value via desired benefits, whether functional or emotional; have a prestigious image within the market built on qualities such as artisanship, craftsmanship or service quality; be worthy of commanding a premium price; and be capable of inspiring a deep connection, or resonance with the consumer. (Ko et al., 2019, p.406).

To that definition, McKinsey Corp added that luxury brands are those which “*have constantly been able to justify high price, i.e. significantly higher than the price of products with comparable tangible functions*” (as cited in Kapferer, 2017, p.237).

Regarding luxury goods, they are defined by Vigneron & Johnson (2017) as follows:

Goods for which the simple use or display of a particular branded product brings esteem on the owner, apart from any functional utility. Hence luxury products enable consumers to satisfy psychological and functional needs, and it seems that these psychological benefits are the main factor distinguishing them from non-luxury products or counterfeits. (Vigneron & Johnson, 2017, p.202).

3.1.3 Characteristics

The different characteristics of what constitutes a luxury brand are summarized in the table below:

Table 3: Characteristics of luxury brands

Craftsmanship
Exclusivity
Uniqueness
Country of origin
Brand building
Lifestyle creation
Performance and innovation
Style and design
Premium quality

Craftsmanship: It is impossible for luxury products to be totally handmade, but it must have, even a small part been handmade (Bastien & Kapferer, 2012). This is the dimension that takes it out of the mass production, out of the world of the factory (Bastien & Kapferer, 2012).

Exclusivity and uniqueness: Luxury products present elements of uniqueness that cannot be found anywhere else and luxury brands aim at being totally exclusive, reserved for only a small part of the population that can afford to pay high prices (Godey et al., 2012). That is an important element that differentiates the mass market from the luxury one. Companies that operate in the mass market are seeking to deliver low-cost products available to a large number of consumers (Brun et al., 2008) while brands performing in the luxury market aim at providing exclusive and expensive products to an elitist and limited segment of consumers (Brun et al., 2008). Exclusivity is not the primary valuation factor, but its absence is a devaluation factor (Bastien & Kapferer, 2012). Indeed, luxury brands have different tactics in order to preserve exclusivity; they usually produced in limited quantities with limited distribution (Kapferer, 2017).

Country of origin: Within luxury sector, the “made-in” association is really important and can be a significant factor influencing the purchasing decision of consumers. (Brun et al., 2008; Godey et al., 2012).

Brand building, emotional appeal and lifestyle of the creator: Luxury consumers during their purchasing decision seek more and more for a strong identification of the product and pay attention to the value conveyed by the brand (Brun et al., 2008). Indeed, as stated by Choi & Liu (2019), brand image is crucial in luxury and therefore, advertising is known to be critical in order to build the luxury brand. In the same way, luxury brands aim at creating and telling a whole story about the creation of the brand, the creator, the history behind it, etc. to enhance mystery and drive curiosity (Bastien & Kapferer, 2012). As said by Bastien & Kapferer, (2012) in their book, *“no luxury brand without roots, without history to provide a non-commercial dimension to the brand”*. This universe which gravitates around the brand creates a dream, a desire in which consumers want to plunge in (Bastien & Kapferer, 2012).

Performance and innovation: Foray, (2013) highlighted the fact that the evolution of the luxury industry is driven by creativity, innovation and the exploitations of new technological opportunities. Within the luxury sector we have a monopolistic competition based on products and services differentiation which is very favourable to innovation (Foray, 2013). Moreover, the luxury industry possesses an important characteristic that is its ability to combine innovations from different activities; science driven, artistic creativeness and the one based on traditional craftsmanship (Foray, 2013).

3.2 Luxury markets

3.2.1 Luxury industries

The luxury market covers a large range of products, from cosmetics to cars and yachts, hotel or bags but also, food and drink, watches and jewellery (Caniato, Caridi, Castelli, & Golini, 2011). Luxury goods can be divided into two categories of products: functional and emotional products (Brun et al., 2008). The first one refers to items that are recognized for their technical features such as cars, yachts, etc. It is the product that people would mainly buy for their world-class performance and engineering (Brun et al., 2008). On the contrary, emotional products are

those that people will purchase for the value they deliver as for instance the lifestyle or the value a brand projects (Brun et al., 2008).

According to a report from Bain & Company (D'Arpizio, Levato, Prete, & Gault, 2019), the sales of luxury cars continue to dominate the market with a growth of 7%. Regarding the personal luxury goods segment, they encounter a more moderate growth, shoes and jewellery being the outperformers of this segment (growth of 9%), followed by leather goods (growth of 7%) and beauty (growth of 3%) (D'Arpizio, Levato, Prete, & Gault, 2019).

3.2.2 Growth

Several studies have reported that the global market for luxury goods has grown over the past two decades (Moon & Sprott, 2016). According to a survey conducted by Statista (Mehta, Degenhard, Brinckmann, & Hamke, 2019), the global luxury goods market is expected to increase at a rate of 2.1% from 2018 to 2022. Mehta et al. (2019) identified this market growth as being due to two main factors: resurgence in Chinese spending and the increasing dominance of Millennials and Generation Z. Ko et al. (2019) also identified that the key catalyst to that global phenomenon is the raise in luxury consumption in the Asian markets. Indeed, a survey conducted by Boston Consulting Group & Altagamma (2019) about the luxury consumers, showed that China continues to be the driving force and its luxury consumption is expected to continue growing for the next few years.

To these two factors, Kapferer (2017) identified another source of luxury market growth: the vast number of “excursionists”. This term refers to ordinary people from upper middle classes who aim at imitating their wealthy peers by occasionally buying small products of prestigious brands (Kapferer, 2017). This trend refers to what is called “democratization of luxury goods” meaning that luxury brands are accessible to a wider audience (Keinan et al., 2020).

3.2.3 Luxury consumers: Millennials and Generation Z

The emotional factors have been getting more and more important, as customers are looking for goods that are characterized by reliable performance and perfection of detail, but at the

same time they want to be emotionally involved (emotional appeal) and feel a complete and memorable shopping and ownership experience (Brun et al., 2008).

The luxury industry has to respond to these market requirements. Boston Consulting Group (2019) has identified the new generation that would buy luxury products. The new luxury shoppers are the Millennials (also known as Generation Y) and Generation Z, who have a different set of behaviours and values (Boston Consulting Group, 2019).

de Kerviler & Rodriguez, (2019) define the Millennials as being a particular group of individuals born between 1979 and 1995 that share common values, beliefs and experiences. They are more sophisticated shoppers, more influenced by the symbolic aspects of the luxury brands and they are more eager to exercise social influence which impacts their purchase intentions towards luxury products (de Kerviler & Rodriguez, 2019). The important role of the brand in the consumers' identity project is also identified in Morhart, Malär, Guèvremont, Girardin & Grohmann (2015) paper. Millennials consume luxury goods not only to signal status but aiming at differentiating themselves, to be unique, and as a way of self-expression seeking for products that align with their values, desires and identity (de Kerviler & Rodriguez, 2019; Keinan et al., 2020). A report from Bain & Company (D'Arpizio et al., 2019), identified that Millennials accounted for 35% of consumption in 2019 but are expected to reach 45% of the market by 2025.

“Gen Z” are the younger generation (born between 1995 and 2005) expecting to reshape the luxury sector (D'Arpizio, et al., 2019). In the same report, it was identified that “Gen Z” will also display different behaviours in order to differentiate themselves from other generations (D'Arpizio et al., 2019).

These two new generations already contributed to all market's growth in 2019 and are expected to dominate the luxury market with disruptive consumer trends (D'Arpizio et al., 2019). Both of these new generations of luxury product consumers have recently extended their quality expectations to social and environmental dimensions (Achabou & Dekhili, 2013).

3.3 Luxury and sustainable development

This section aims at providing an objective analysis of the literature seeking to establish whether or not luxury and sustainable development are two compatible concepts and why it is important for luxury brands to engage in sustainability. We will only focus on the environmental parts of CSR for two reasons. First, the longest-running criticisms that the luxury industry have faced concern environmental issues such as the threat to endangered species, cruel treatment of animals and pollution (Keinan et al., 2020). Secondly, as seen several times in the literature, one of the values of luxury brands is localization as it is part of the culture or historical reference that is embedded in their products (Keinan et al., 2020). Many luxury companies do not delocalize as mainstream brands do because many are completely vertically integrated or exert tight control over their suppliers (Keinan et al., 2020). Indeed, Dedagroup (2019) conducted an analysis on the latest supply chain trends within the luxury sector and showed that a new strategy was to buy the entire supply chain to gain more control, such as the French group Kering, the Maison Chanel and the brand Burberry did by buying several of their suppliers. Even if it does not mean that there are no social issues within luxury sector (e.g., “blood diamond”), for these two reasons we decided to focus on environmental issues.

3.3.1 (In)consistency between luxury and sustainable development

A lot of research has been conducted in order to know whether luxury and sustainability are two compatible concepts. At first glance, luxury and sustainable development seem incompatible. To explain that, some authors have taken this issue at the source; the Latin roots of the word luxury, *luxus*, means living soft or extravagant, sumptuousness and opulence while *luxuria*, also from Latin roots, means excess or extra life (Brun et al., 2008). In addition, by definition luxury evokes hedonism, excess and ostentation while CSR generally evokes sobriety, moderation and ethics (Amatulli, De Angelis, Korschun, & Romani, 2018). Moreover, Costa Pinto, Herter, Gonçalves, & Sayin, (2019) stated that luxury brands are associated with concept such as « self-enhancement » which is not compatible with social responsibility as it does not lead to a general benefit for the society. In their paper, Keinan, Crener & Goor (2020), mentioned the fact that sports cars, yachts, private jets as well as luxury brands typically require significant amounts of resources and energy to be operated and

maintained while they are only serving a limited number of consumers and therefore, luxury companies seem to have larger negative sustainability effects compared to their non-luxury counterparts. In order to illustrate the inconsistency between these two concepts, the table below summarizes the characteristics:

Table 4: Contradiction between luxury and sustainability (Keinan, Crener & Goor, 2020)

Luxury	Sustainability
Emotions Excess Social distinction Self-enhancement Dream	Rationality Frugality Equality Self-transcendence Reality

Moreover, the different industries within luxury sector encompasses many environmental (and social) issues. For instance, issues such as selection of production materials, material sourcing exists among automotive, jewellery and watches industries (Stoycheva, Marchese, Paul, Padoan, Juhmani, & Linkov, 2018; Thammaraksa, Wattanawan, & Prapasongsa, 2017). Regarding the textile and leather goods supply chain, material sourcing is also an issue as a lot of material require great amount of water (or come from endangered species) and the use of chemical utilization is common (Karaosman et al., 2018).

Despite all the prior findings about this compliance, there are also burgeoning evidences that luxury and CSR might be compatible. Indeed, definitions of sustainability and luxury both focus on resources rarity. Luxury is about high quality product that are objectively rare because they employ rare materials and unique craftsmanship skills which follows sustainable development that is about preserving natural resources by limiting excessive use of materials that can exceed the world's recycling capabilities (Amatulli et al., 2018). Moreover, sustainability is not only about longevity but also quality, a point where these two concepts converge as the luxury industry aims at preserving the art and "savoir faire" and respecting the environment (Aybaly, Guerquin-Kern, Manière, Madacova, & Holt, 2017). Achabou & Dekhili, (2013) agree by describing luxury as being the transmission of ancestral skills and preservation of raw material and local activities. Moreover, luxury brands typically manufacture limited quantities of products in order to be exclusive, and the quality of those goods often means that they have a long lifecycle (Amatulli et al., 2018). As a result, luxury brands waste significantly fewer resources compared to mass market brands.

3.3.2 Importance for luxury brands to engage in sustainability

We have seen that the global luxury market continues to grow year after year. This tremendous growth from the luxury sector also has a downside as it brings higher visibility, which has also increased its exposure to criticism (Kapferer & Denizeau, 2017). Criticisms within this sector tend to refer to hidden parts of the supply chain such as raw materials sourcing (e.g., checking the source of all animal skins, gold), animal treatment (e.g. crocodile farms, killing baby seals for fur), human work conditions (e.g., gold), manufacturing methods polluting the local environment (e.g., use of mercury for tanning skins) or destruction of the environment (e.g., endangered tree species used in the luxury furniture business, exploitation of rare water resources by luxury golf clubs and hotels situated in poor countries) (Kapferer & Denizeau, 2017). Therefore, luxury companies by not taking enough action or by miscommunicating about their sustainability measures, encountered a **reputational risk** linked to scandals, malpractices or greenwashing, especially with modern communication that allow activist and consumers to disclose news rapidly and widely (Kapferer & Denizeau, 2017; Keinan et al., 2020). Indeed, as Kapferer (2010) mentioned in its paper, luxury brands have every incentive to engage in environmental practices as now internet, bloggers and new technology can reveal the real condition behind the perfect image conveyed by those firms. Luxury brands' success mainly relies on their image and their value and hence, if they fail to endorse and promote sustainability, the potential harm to their brand image will be at a more significant scale than in any other sectors as their brand image is crucial to their survival (Aybaly et al., 2017).

It is not only pressure from media, NGOs and shareholders that drove luxury to convert to more sustainable practices, **consumers** also impacted that industry (Aybaly et al., 2017). The new generation of luxury consumers, the Millennials and Generation Z, express new concerns giving rise to the consumption of products which are less toxic, more durable and made from recycled materials (Achabou & Dekhili, 2013). Indeed, according to Kapferer & Denizeau (2017), customers are becoming increasingly focused on topics such as the origin of ingredients and raw materials, animal welfare and environmental impacts of products. An analysis from by Bain & Company on the luxury market (D'Arpizio et al., 2019), showed that 80% of luxury consumers say that they prefer brands that are socially and environmentally responsible, particularly among Millennials. Indeed, as reported by a survey conducted by Mintel in 2015 on consumer behaviour, risks are high as 51% of consumers think they should boycott retailers

that do not act in an ethical manner (as cited in Keinan et al., 2020). Besides those numbers, 60% of luxury consumers believe that luxury brands should be more engaged than any other industry (D'Arpizio et al., 2019). This might be explained by Keinan et al. (2020), reporting that luxury brands are influential and aspirational trendsetters that other brands copy and imitate and therefore, the sustainable practices they adopt, can significantly impact consumption in other sectors. Maditati, Munim, Schramm, & Kummer (2018) also revealed in their study that leading firms undertaking sustainable initiatives towards their supply chains could enhance and encourage other stakeholders (e.g., suppliers) to take those initiatives.

It is also important for luxury brands to engage into sustainability because of the **democratization of luxury**. Indeed, we have seen that luxury is now accessible to a larger consumer audience driving “real” luxury consumers to sophisticate their purchasing behaviour, seeking new ways to consume luxury and alternative methods to signal their status (Keinan et al., 2020). Among those new methods, sustainable consumption is becoming a new form of consumption in many Western countries and appeals to well-educated segment of consumers that can act as conspicuous signalling. (Keinan et al., 2020)

3.3.3 Luxury and transparency

Transparency was defined in the annual report “Fashion Transparency Index” of Fashion Revolution (2020) as follows:

“Public disclosure of creditable, comprehensive and comparable data and information about fashion’s supply chains, business practices and the impacts of theses on workers, communities and the environment”. (Fashion Revolution, 2020, p.9).

The trend for more transparency has also affected the luxury sector where consumers have expressed their demand for more transparency, especially with the digital age (Keinan et al., 2020). However, there is an increasing paradox regarding the luxury sector. On the one hand, there is this request identified by Le Centre du Luxe et de la Création & Boston Consulting Group (Abtan & El Ghouzzi, 2018) for transparency regarding the products consumers buy that forced luxury brands to move from a “storytelling” to a “storyproving” communication as the product itself needs to carry a beautiful and true story from its manufacture, to its launch

on the market, story that must be intrinsic to the product and life of the company. Sustainability can no more only be a defensive argument, luxury brands need to be proactive as it becomes a purchasing argument (Abtan & El Ghouzzi, 2018). On top of being sustainable, luxury brands must anticipate traceability and authenticity that can no longer be implemented reactively (Abtan & El Ghouzzi, 2018). On the other hand, even though luxury brands want to immerse their consumers into the heritage, the history of the brand, they have traditionally been discreet and even secretive about their operations, driven by the worship of secrecy in order to protect their mystique (Keinan et al., 2020). Indeed, Darène (2012) emphasized the importance of the worship of secrecy within the luxury sector as being a significant market value to preserve. This culture of secrecy is, for luxury goods, the element that is conducive to conveying the image of mystery in brand management, creating the dream (Darène, 2012).

Every year Fashion Revolution (2020) which is a global movement aiming at changing the way clothes are sourced, produced and consumed in a fair, clean and safe way, reveals what they call “Fashion Transparency Index”. This report assesses and ranks based on five criteria, 250 of the largest global fashion brands and retailers on how much information they disclose about their suppliers, supply chain, social and environment impact. In their latest report (2020), Gucci is the highest scoring luxury brand, followed very closely with the other brands of the Kering Group (Balenciaga, Saint Laurent and Bottega Veneta) (Fashion Revolution, 2020). Even though they were not listed in this report, other luxury brands have started to be more transparent: Louis Vuitton has opened up its workshops to the public in order to show how products are manufactured, while Tiffany & Co. started to display to consumers how diamonds were sourced (Keinan et al., 2020).

However, the “Transparency Index 2020” report demonstrated that there is still a severe lack of transparency on social and environmental issues for the majority of the brands: more than half (54%) scored 20% or less in transparency and traceability (Fashion Revolution, 2020). However, Fashion Revolution emphasizes the fact that being transparent does not mean that firms are socially and environmentally responsible: transparency is a tool for change, it is what will allow social and environmental issues to be addressed more quickly and collaboratively (Fashion Revolution, 2020).

3.4 Luxury and blockchain

3.4.1 Blockchain within luxury industry

Even though the luxury industry is still usually traditional “Maison” that does not really cope with new technology, they are trying to keep up with all the innovations. This is one of the significant challenges in the luxury sector; trying to be modern but at the same time, conserving traditions. However, some major organization such as LVMH has started to pay more attention to new rising technologies and blockchain is one of the innovations that attract luxury brands’ attention for many reasons (Stim, 2018).

First, as Montecchi et al. (2019) had mentioned in their study, blockchain is especially appropriate in situations where the purchase decision for the consumers involve high investments, which is usually the case for luxury products. Blockchain within the luxury sector might therefore represent a strategic investment for firms operating in a highly desirable products market with high risk of counterfeiting (Montecchi et al., 2019). The possibility to fight against counterfeiting through blockchain was also developed in an article written by Capital (Raymond, 2020) saying that blockchain would allow the formation of unique authenticity certificates that would be impossible to copy. Nowadays, the counterfeit market accounts for 5-9% of the world trades, which have caused luxury brands billions of dollars in lost sales (Maria Pinto da Cunha Brandão & Gadekar, 2019).

Secondly, we have seen that even though aesthetic, quality, prestige, and rarity of raw materials remain essential elements, Millennials and Gen Z are more concerned with ecological and social issues of products manufacturing (Stim, 2018). Therefore, luxury companies must allow their customers to ensure that their actions are not just greenwashing or communication polishing (Stim, 2018). Applied to the supply chain within luxury sector, this technology would make possible to register the identity of a manufacturer to guarantee that this registration remains forgery-proof and hence, to prove in any circumstances the true origin of the product (Stim, 2018). It would benefit luxury brands as consumers are seeking greater transparency and traceability giving importance to the “made-in” reference, the country-of-origin that tends to negatively affect consumers’ purchasing when they perceive the level of transparency is not high enough (Keinan et al., 2020; Godey et al., 2012).

By recording and time-stamping the entire manufacturing process via the blockchain, companies could provide customers with much more information; for instance, proving that a diamond did not come from a war zone, that a garment was not made by children or even that materials used in the production process are organically grown (Stim, 2018).

3.4.2 Current applications

In recent years, with the growing interest towards blockchain technology, several applications were developed such as Hyperledger; *“an open source community focused on developing a suite of stable frameworks, tools and libraries for enterprise-grade blockchain deployments”* (Hyperledger, n.d.). VeChain is another blockchain that started in 2015 in Singapore aiming at *“building a trust-free and distributed business ecosystem to enable transparent information flow, efficient collaboration and high-speed value transfer”* (VeChain, n.d.). VeChain is one of the rare and few blockchain platforms with real business applications within companies across multiple sectors worldwide.

Focusing more on the luxury sector, several platforms have also already been developed. LVMH which is the leader of the luxury sector, developed in collaboration with other companies, its own platform, AURA (Thompson, 2019). It was first applied to two of their brands: Dior and Louis Vuitton (Bodnar, 2019) but it is now expanded to the other brands of LVMH (Kenzo, Givenchy, etc.) (Journal du Luxe, 2019). This platform aims at serving the entire luxury sector making it possible for consumers to access the product history through an application, QR code, in order to ensure the authenticity of luxury goods from raw materials to the point of sales and even the all the way to second-hand markets (Journal du Luxe, 2019).

Another blockchain within this sector is Luxochain. In the same way as AURA, Luxochain aims at providing digital certificates of authenticity registered on the blockchain but emphasizes a bit more the sustainability aspect that can be enhanced through blockchain. Indeed, Luxochain collaborates with three other companies PwC, Temera and Virgo. The latter is a sustainability, reputation and authenticity platform dedicated to fashion and luxury (Luxochain, n.d.). Virgo helps companies to track & certify single activities along the whole supply chain, ensuring transparency, trust, sustainability certification and reputation through the use of blockchain (Virgo, n.d.). Therefore, luxury brands can certify sustainability,

traceability and authenticity of their products and consumers can access that information through an application allowing consumers to have insights on the product of origin, the carbon footprint it required to manufacture the product, etc. (Luxochain, n.d.). The most important sectors of application are identified to be fashion, luxury, art, medical, pharmaceutical, food and automotive.

Everledger is another well-known blockchain developed across several sectors (diamond industry, luxury goods sector, art, medical, wine and spirits, e-recycling and insurance). According to an article from *Le Monde Informatique* (Sayer, 2016), Everledger propose a certification service capable of proving the origin and identifying the owner of the diamonds registered in its ledger, which is very important in many luxuries supply chain as provenance and authenticity are significantly valued in the luxury sector (Choi, 2019). In addition to that, Everledger places sustainability at the core of their culture and hence aims at providing more knowledge, transparency and sustainability through blockchain technology (Everledger, n.d.).

PART II: Practical analysis

4. Problematic and research questions

4.1 Conceptual model framework

The theoretical analysis provided a relevant background and a good overview on blockchain, its mechanisms and applications within a particular sector, the luxury sector. Over the exciting analysis of market requirements from luxury consumers, it drove a significant conclusion: the level of transparency through blockchain represents a perfect and interesting study subject for the future of sustainability in this sector.

Key trends are at stake in the luxury sector. First, while demand for transparency has increased, becoming a hot topic within the luxury sector, younger generations have also displayed new behaviours affecting the luxury market. Indeed, Millennials and Generation Z, who will in a few years constitute the main demand for luxury products, grow concerned about sustainability. A report from Bain & Company (D'Arpizio et al., 2019) showed that 64% of Millennials and 64% of Generation Z are influenced by sustainability.

Secondly, some luxury brands have started to invest in blockchain as studies have emphasized the capabilities this tool could deliver. Among them, the level of transparency and the possibility of tracking products could positively impact the luxury sector as it responds to authenticity issues, fighting against counterfeit products and enhancing sustainability practices owing to the level of transparency.

Therefore, the following framework (Figure 2) was drawn up based on the literature, to try to understand which factors may play a role and motivate luxury consumers to use blockchain to validate environmental information of the desired products and the effects blockchain could have.

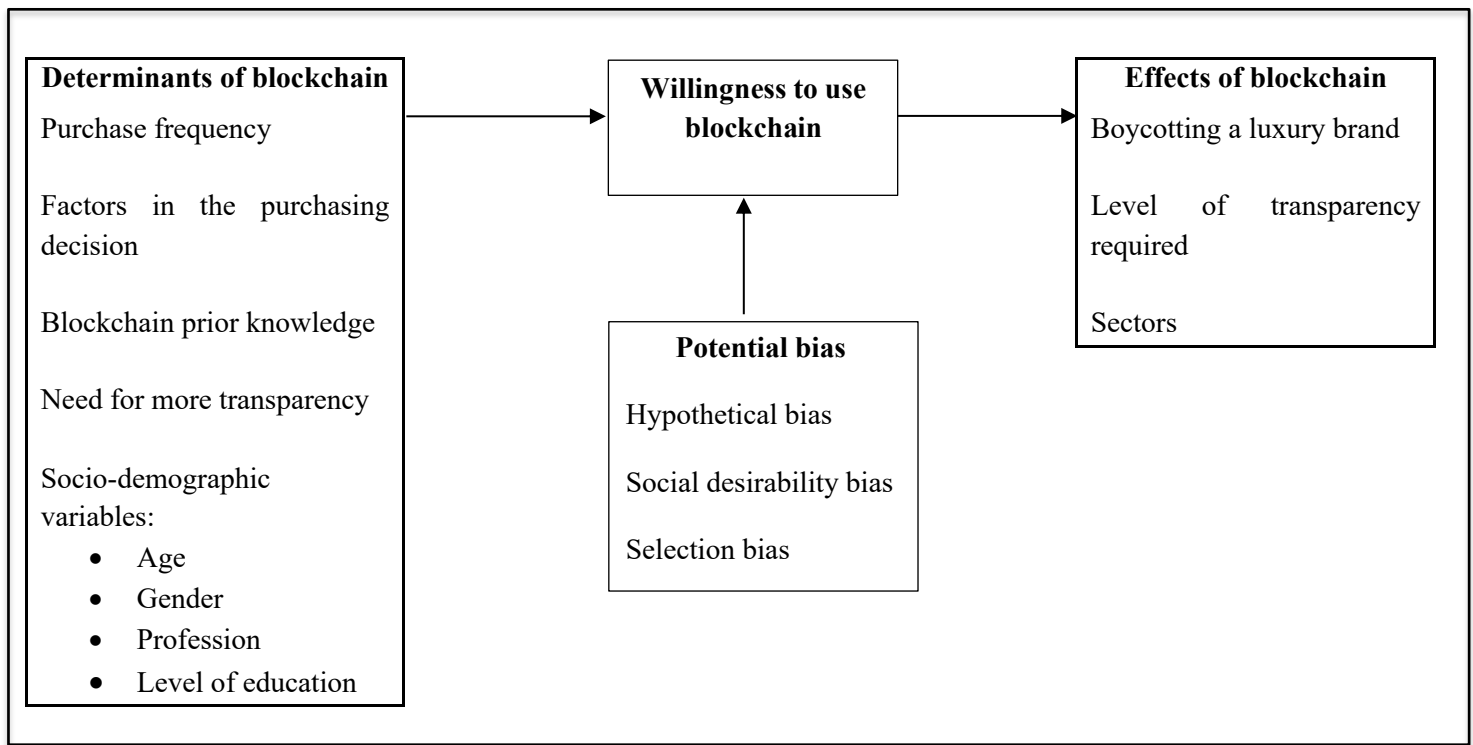


Figure 2: Framework of willingness to use blockchain

Hence, this has led to more specific questions:

- Which variables affect the use of blockchain?
- What are the potential barriers for using blockchain?
- Will luxury consumers change their purchasing behaviour?
- What level of transparency are luxury consumers really searching for?
- Are there sectors in which luxury consumers would want to have more transparency regarding environmental practices?

All of these questions will be translated into hypotheses that the practical section will try to validate or refute.

4.1.1 Determinants of willingness to use blockchain

The elements found in the literature that could affect the willingness of using blockchain are multiple. First, the purchase frequency might have an effect. Indeed, for luxury purchases that are less frequent, rare and expensive, consumers' interest in sustainability is not high, meaning that consumers might not be interested in having full access to environmental information regarding the product they are purchasing (Kapferer & Denizeau, 2017). However, they might

strive to have access to information regarding the authenticity or raw materials used for the product.

Secondly, the factors playing a role in the purchase decision of luxury consumers might also impact the willingness to use blockchain. For instance, if luxury consumers value environmental practices, they might be more likely to use blockchain in order to check environmental information. Thirdly, we have seen many times in the literature that there is a real need for transparency. Therefore, this can be a determinant in the willingness to use blockchain for environmental reasons, as consumers might want to check how the product was made, which materials were used, and what impact the production can have on the environment. Finally, we will also test socio-demographic characteristics in the identification of factors influencing willingness to use blockchain.

4.1.2 Effect of blockchain

Once the factors that influence the willingness to use blockchain are known, the second part that we will assess relate to future hypothetical behaviour. As literature demonstrated, risks are high for companies that have not engaged environmental practices, as 51% of consumers think they should boycott retailers not acting ethically (as cited in Keinan et al., 2020). Therefore, we can wonder whether the use of this tool for environmental purposes could have effect on luxury consumers' purchase behaviour.

4.1.3 Potential bias

Bias can occur while conducting this analysis and more specifically regarding the answers to the questionnaire. First, hypothetical bias, also known as belief vs. behaviour, appears when questions are about attitudes or beliefs (hypothetical) and therefore, the respondents might answer differently as they do not have to manifest their choices with real commitments (Choi & Pak, 2005). Therefore, we need to be careful with the interpretation of the results as it might not reflect the respondents' real behaviour.

This research could encounter another form of bias, one of social desirability. Indeed, the study includes “sensitive” subjects (e.g. respondents’ sustainable behaviour) and therefore respondents could answer more favourably than the reality in order to project a positive image and try to “look good” (Fisher, 1993).

5. Methodology

To answer our research questions, it necessary to set a methodology in order to support the practical analysis and collect primary data.

Therefore, the first step is to decide the research method to establish a general plan of how to get answers to research questions. More specifically, it is “*the way a research question and objectives are operationalized in a research project*” (Saunders, Lewis, & Thornhill, p.209) Once it is decided, the second logical step concerns the research strategy which is “*the plan of how you will go about answering your research question(s)*” (Saunders et al., 2016, p.163).

5.1 Research method

The purpose of this research has an explanatory dimension as we try to establish causal relationships between variables. Explanatory research questions are likely to start or include “how” or “why” (Saunders et al., 2016).

In the context of this explanatory research, primary data collection will be needed to fill the missing literature gap on the subject as it helps gather information and opinions about the subject covered. Therefore, it is important to decide whether to follow a quantitative or qualitative analysis before choosing the right research strategy. As this research aims at testing theories or broad explanations, at measuring variables and assessing the impact of these variables on an outcome (Creswell, 2013), a quantitative analysis is selected, and the collected data will therefore be analysed quantitatively.

5.2 Research strategy

The research strategy selected in order to collect primary data is the survey method which is a quantitative method that allows the collection of standardized data from a sizeable population (Saunders et al., 2016). The survey research strategy is used when the purpose of the research is explanatory or descriptive and is relevant when a researcher wants to test an activity or materials, the associations among variables or when seeking to describe trends in a large population of individuals (Creswell, 2013). Conducting a survey research strategy is therefore meaningful in the framework of this thesis. While it is only reserved for individuals with access to the Internet (selection bias), it has the advantage that the response rate is usually higher than other research strategies (Saunders et al., 2016).

In their book, Saunders et al. (2016) emphasize the importance of choosing a time frame for every research. He identified two possibilities; either cross-sectional or longitudinal (Saunders et al. 2016). This study is a cross-sectional research as it “*studies a particular phenomenon at a particular time*” (Saunders et al. 2016). Indeed, due to time constraints, this project is limited in time, and therefore every gathered data provides information for a particular moment of time, what Saunders, Lewis, & Thornhill (2016) called “snapshots”.

5.3 Data collection and data analysis

5.3.1 Online questionnaire

The technique used in order to answer the research questions is the survey. This online questionnaire enables the collection of quantitative data that result in statistical analysis (Saunders et al., 2016). This online questionnaire took between five and ten minutes, was designed on Microsoft Form, available in three languages (FR-NL-EN) (Appendix Survey 1). It was active from May 15th to June 15th. The questionnaire began with a short introduction in order to explain the subject and was directly followed by a filter question “*Are you a consumer of luxury goods*”; if respondents answered “*No*”, the survey stopped.

The questionnaire followed a specific structure; it was divided into five sections that were previously mapped in order to visualize the different drivers and relationships each section could have on the other (Appendix Survey 2).

Variables on luxury purchasing behaviour. This first set of questions assessed the respondent's purchasing behaviour. Four questions served as introductory questions in order to "warm up" the respondents. The purpose of this section was to "draw" a profile of consumers and have insights on whether they have for instance, already adapted their consumption for environmental reasons. Therefore, the respondents had to indicate the frequency at which they purchase luxury products. Subsequently, the respondents had to state the type of products they commonly buy (cosmetics, perfumes, ready-to-wear, cars, jewellery, watches, shoes, leathers goods). Furthermore, they were asked to specify which factors they take into account when purchasing luxury products (e.g. environmental practices, quality, traceability). Then, a question asking them to state their engagement to a brand was asked. In the last question, they had to indicate whether they already switched luxury brands for environmental reasons.

Environmental attitudes. This question assessed the respondents' environmental behaviour in their daily life. This question allows an insight into how sustainable respondents live. A list of 10 sustainable actions were proposed and they were asked to state on a 5-point Likert scale (never to always), if these actions are implemented in their daily life. These actions are based on the "Framework for shaping sustainable lifestyles" established by the United Nations Environment Programme [UNEP] (Akenji & Chen, 2016). This framework outlines a set of key behaviours constituting a sustainable lifestyle such as using a bike or walking for short distances, paying attention to water and energy consumption, avoiding food waste, etc.

Transparency with blockchain. This part and the next part of the survey are crucial for the analysis. It encompasses questions regarding their knowledge of blockchain before reading the detailed explanation. Furthermore, a question where they have to express the need for transparency was asked. Finally, a question allowed respondents to give their opinion on blockchain.

Future purchasing behaviour. This set of questions relates to the hypothetical future change in their purchasing behaviour. It will need to be carefully interpreted as the subject covered by this survey is not commonly known and therefore could result in an "uninformed response"

which is a tendency encountered when respondents guess the answers when having insufficient knowledge or experience (Saunders et al., 2016). To avoid it and make sure that the respondents answered more precisely and knowingly, a short but detailed description of blockchain was given. Therefore, questions on potential barriers for this tool such as necessity, use and trust were asked as well as the sector in which respondents would want to have more transparency. Subsequently, respondents state the level of transparency (e.g., raw material, production process, country of origin) they require. And finally, a question to know whether they would boycott or change luxury brands after having access to information that were not environmentally favourable, closes this section.

Socio-demographic variables. The last part of the survey includes questions regarding demographic characteristics. The respondents were asked to indicate their age, gender, level of education, profession and country of origin. These independent variables can have influence on the use of blockchain for environmental purposes. The age was an open question and the categories were determined as follows: 17-25, 26-35, 36-45, 46-55, 56-65, 66-75, > 75, based on a study conducted by Kapferer (Kapferer & Denizeau 2017). Regarding education, the respondents must indicate their highest obtained level of education among the following choices: no diploma, secondary school, bachelor's degree, master's degree and doctorate. The country of origin is asked as an open question. Finally, profession needs to be considered and the respondents can indicate their profession on a closed list of several propositions: Farmer/landholder, craftsman/trader, executive/senior management, liberal professions, employee, worker, student, retired or unemployed.

5.3.2 Sampling method and limits

Saunders et al. (2016) mentioned in their book, that sometimes it is unnecessary or impracticable to collect data from the entire population and therefore, sampling is used. Two types of sampling techniques exist: probability or non-probability. The first one is used when the researcher can access to a database while the former is applied when it is more difficult to have a sampling frame (Saunders et al., 2016).

This study is compelled to use a non-probabilistic sampling technique given the absence of a complete sample frame. Indeed, although non-probabilistic techniques are subject to

subjectivity and influenced by the researcher, this technique is used when it is difficult to identify members of the desired population (Saunders et al., 2016), which is the case for this project; consumers of luxury goods are not an easy target population. For this technique, the researcher selects individuals because they are available, convenient and represent some characteristics the investigators seek to study (Creswell, 2013.) Saunders et al. (2016) identifies two steps to take once the researcher has chosen whether it will be a non- probability sampling technique to use:

1. Deciding on a suitable size
2. Selecting the most appropriate sampling technique.

First, regarding the size, many books stated that *“the larger your sample’s size the lower the likely error in generalizing to the target population”* (Saunders et al., 2016, p.279). Indeed, in his book, Creswell (2013) emphasizes the importance of having the largest sample as it will decrease the difference between the sample estimate and the true population score, which is called sampling error. However, the size of the sample will be influenced by many factors such as access, funding, overall size of the population and so on (Creswell, 2013). In this case, as the target population was not an easy target to reach (e.g., consumers of luxury goods), we set the minimum required at 250, in order to have a representative sample.

Secondly, several non-probability sampling techniques exist and the one chosen here was the volunteer technique and more precisely the “snowball” one. It consists of making contact with a few cases in the population, asking them to identify further cases that will also identify further new cases and so on (Saunders et al., 2016). The advantages of this technique are that it will recruit a large number of participants for the study and the relative costs are low (Saunders et al., 2016). Besides these advantages, this technique also counts some limits important to take into account when interpreting the results of this study. While it recruits a large number, it also leads to not knowing exactly what individuals respond to the questionnaire and therefore, knowing whether they are representative of the population (Creswell, 2013). By consequences, the results cannot be projected on every luxury consumer as it might not be representative even though some trends and results found in the analysis might be applied at a larger level.

Seeking and striving to have the largest and the most representative sample, different strategies were set up in order to reach the maximal amount of the target population. First, having some

contacts working in the luxury industry, emails were sent with an explanation of the goal of the survey and asking them to share it with every acquaintance, friend, family, colleague, etc. they might think would be relevant for this study, and to their client base (respecting of course, GDPR regulations). Secondly, the survey was posted on social media (LinkedIn and Facebook) a few days later, asking again, to share it with a maximum amount of people. Then, luxury brands were also contacted on their website platform and most of them answered positively. Trying to have even more respondents, an idea was to generate a QR code of the survey and distribute it in several luxury boutiques, but this idea was compromised with the COVID-19 crisis.

5.3.3 Data analysis

5-point Likert type scales were used within the questionnaire, which allowed the quantification of responses submitted by participants. All the graphs and statistical tests were realised with the Statistical Package for Social Sciences (SPSS). For every statistical test, the null hypothesis was rejected for a p-value lower than 0.05 (Appendix Statistical Outputs 1).

6. Analysis and results

6.1 Sample description

Our sample of 267 respondents (Appendix Survey 3) includes luxury consumers ranging from 17 years old to 89 years old with 61% of women compared to 39% of men. This slight imbalance can be explained by a study that showed that women are usually more likely to participate in online surveys than men (Smith, 2008). Regarding the country of residence, most of the respondents come from Belgium (88.4%) or other countries in Europe such as France (3.4%), Switzerland (2.2%) or Holland (1.5%). This comes from the snowball sampling method whereby respondents are searched for in the social circle of the researcher. More than three quarters of the respondents (84% - 223) have at least a bachelors' degree. This inequality is explained by Smith (2008) in his paper, stating that highly educated people are usually more likely to participate in surveys than less educated ones. This imbalance in our case is relevant and interesting as Bastien & Kapferer (2012) mentioned in their book that the level of education is the second explanatory factor for purchasing luxury goods. Indeed, there is a cultural

dimension to luxury; a higher level of education increases the propensity to buy luxury goods (Bastien & Kapferer, 2012). If we look now at the age of the respondents, we can see that the more represented segment is the younger one (around 21-24 years old), closely followed by the age range of 46-55. Again, this may be the result of the snowball sampling method. The table 5 below presents the socio-demographic breakdown of the sample.

Table 5: Frequencies of socio-demographic characteristics

Frequencies		Number of observations (n)	Percentage (%)
Gender (<i>N</i> = 267)	Men	103	39
	Women	164	61
Age (<i>N</i> = 267)	17-25	64	24
	26-35	24	9
	36-45	44	16,5
	46-55	59	22,1
	56-65	41	15,4
	66-75	25	9,4
	> 75	10	3,7
Country (<i>N</i> = 267)	Belgium	236	88,4
	France	9	3,4
	Germany	1	0,4
	Hong-Kong	4	1,5
	Italy	1	0,4
	Switzerland	6	2,2
	Portugal	1	0,4
	Turkey	1	0,4
	Poland	1	0,4
	Ukraine	1	0,4
	Luxembourg	2	0,7
	Holland	4	1,5
Profession (<i>N</i> = 267)	Farmer, landholder	1	0,4
	Craftsman, trader	8	3
	Executive, senior management	81	30,3
	Liberal professions	30	11,2
	Employee	69	25,8
	Student	42	15,7
	Retired	29	11,2
	Unemployed	7	2,6
Level of education (<i>N</i> = 267)	No diploma	3	1,1
	Secondary school	25	9,4
	Bachelor's degree	68	25,5
	Master's degree	155	58,1
	Doctorate	16	6

6.2 Results

6.2.1 Factors influencing the use of blockchain

In order to assess the influence of the dependent variables (age, gender, diploma, purchase frequency for each sector, requirement for more transparency, sustainable behaviour and the prior knowledge of blockchain) on the potential use of blockchain, a logistic regression has been operated as, the independent variable is a dichotomous variable. The scores of the independent variable (“the willingness to use blockchain”) are represented in Figure 3. We can see that 55% responded favourably to the use of this tool while 37% do not really know if they would use it. It might be explained by the fact that most people did not know about this tool before the questionnaire which might have made them doubtful.

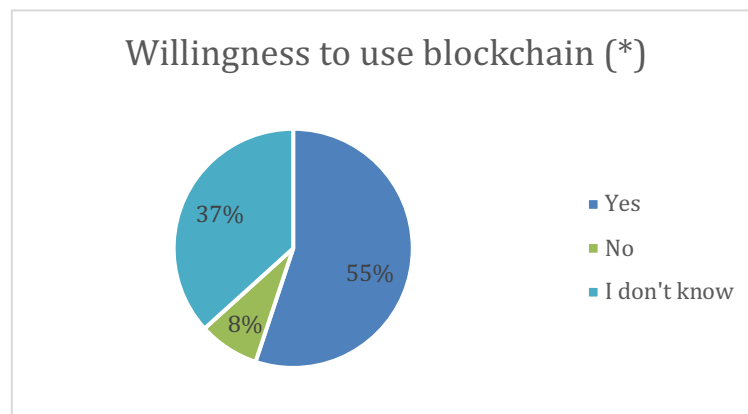


Figure 3: % of the responses obtained for using blockchain

(*) *If luxury brands implemented blockchain, would you use it when purchasing luxury goods?*

The following model can be constructed and will be tested to assess which dependent variables are significant to predict the willingness to use blockchain.

$$\begin{aligned}
 & \log(p/(1 - p)) \\
 &= \text{Intercept} + \beta_1(\text{Gender}) + \beta_2(\text{Age}) + \beta_3(\text{Level of education}) \\
 &+ \beta_4(\text{Sustainable behaviour}) + \beta_5(\text{Purchase frequency}) \\
 &+ \beta_6(\text{Need for transparency}) + \beta_7(\text{Factors in the purchasing decision}) \\
 &+ \beta_8(\text{Prior knowledge of blockchain})
 \end{aligned}$$

At the term of this regression (see Appendix Statistical Outputs 2), we found that only the variable “Eco-practice2”, i.e. the need for more transparency on environmental practices, is sufficient to be able to predict the probability that a consumer will be able to use the blockchain, and we can construct the following model:

$$\log(p/(1-p)) = -3,970 + 1,007 * (Eco - practice2)$$

With this model, we can test the probability of using blockchain with the variable “eco-practice2”:

Table 6: Probability of using blockchain

Eco-practices2	Log(p/(1-p))	$P[Use\ blockchain] = \frac{e^K}{1 + e^K}$
1	- 2,963	0,0491
1,5	- 2,4595	0,0787
2	- 1,956	0,1239
2,5	- 1,4525	0,1896
3	- 0,949	0,2791
3,5	- 0,4455	0,3904
4	0,058	0,5145
4,5	0,5615	0,6368
5	1,065	0,7436

According to this table, an individual with a low requirement of transparency for environmental practices (score = 1) will have a probability of 4.91% to be willing to use blockchain. On the contrary, an individual with a high need of transparency for environmental practices (score = 5) will have a 74.36% chance of being willing to use blockchain.

In order to gain a maximum insight, a question on what would prevent consumers from using blockchain was asked. As we have seen in the literature, the main problem regarding blockchain lies in its misunderstanding and its perception of being a complex tool.

Hypothesis: The utilization of blockchain is negatively influenced by the perception of being a complex tool.

Only the score of the individuals that answered “no” or “I don’t know” to the question “*if luxury brands implemented the blockchain, would you use it when purchasing luxury goods*” will be analysed. Descriptive statistics (Appendix Statistical Outputs 3.1) can be used to answer this hypothesis. Table 7 gives the frequency of response for each proposition:

Table 7: Scores of potential barriers

		1 = Strongly disagree	2 = Somewhat disagree	3= Neither agree nor disagree	4= Somewhat agree	5= Strongly agree
Use – This tool seems too complex to me	N (=120)	2	15	46	46	11
	%	2%	13%	38%	38%	9%
Necessity – I do not feel the need for such a tool	N (=120)	3	14	40	50	13
	%	3%	12%	55%	42%	11%
Trust – I do not think I can trust the data	N (=120)	8	31	40	24	17
	%	7%	26%	55%	20%	14%

A pair-wise Student test (Appendix Statistical Outputs 3.2) was realised to compare the three variables. The results showed that the comparison between the use and necessity variables has a p-value greater than 0,05, meaning that there is no significance between them. However, the p-value is lower than 0,01 when comparing trust with necessity and use. Therefore, we can assume that “trust” issues could constitute a potential barrier for blockchain from luxury consumers.

6.2.2 Change in purchasing behaviour as a consequence of blockchain

The conceptual model presumes that having access to information through blockchain, luxury consumers might change their purchasing behaviour. First, a descriptive analysis of the relevant variables is conducted. Secondly, associations between a variable on boycotting a luxury brand when consumers have checked information in which they are not environmentally favourable (independent variable), and several other variables will be tested.

Descriptive statistics. Table 8 below gathers the answers on the question regarding the potential changes that could occur in their purchasing behaviour. As we can observe, 54% of the respondents would be somewhat ready to boycott a luxury brand, while 46% would not be keen to do so or did not express their opinions.

Table 8: Scores of the paramount variable

		1 = Strongly disagree	2 = Somewhat disagree	3 = Neither agree nor disagree	4 = Somewhat agree	5 = Strongly agree
Using blockchain, I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable.	N (=267)	14	35	74	106	38
	%	5%	13%	28%	40%	14%

Testing associations. It is interesting to look into relationships between the independent variable (e.g., whether they are encouraged to boycott a luxury brand if they access through blockchain information that are not favourable for the environment) and several others.

The first relationship that will be tested is between the independent variable and if luxury consumers have **already changed their purchasing behaviour** for environmental reasons in the past. This leads to the following hypothesis:

H₀: Boycotting a luxury brand due to environmental issues is independent to boycotting a luxury brand in the past.

H₁: Boycotting a luxury brand due to environmental issues is related to boycotting a luxury brand in the past.

The p-value for this test is lower than 0.01 (Statistical output 4) which rejects the null hypothesis and confirmed that the possibility of boycotting a luxury brand is related to previous similar behaviour in the past.

The next relationship that is tested is the **gender**. According to Kapferer (2017), it has been reported that women tend to have greater concern regarding environmental and social issues. In the same way, Kapferer (2017) emphasized the fact that at the behavioural level, women also report purchasing behaviours that are more environmentally and socially responsible. Therefore, we can ask ourselves if gender is a factor differentiating purchasing behaviour when it comes to transparency and sustainability. Indeed, we can imagine that women having access to environmental information regarding the product and/or the brand, could be more likely to boycott this brand than men as they tend to be more sensitive to the environmental subject, in other words:

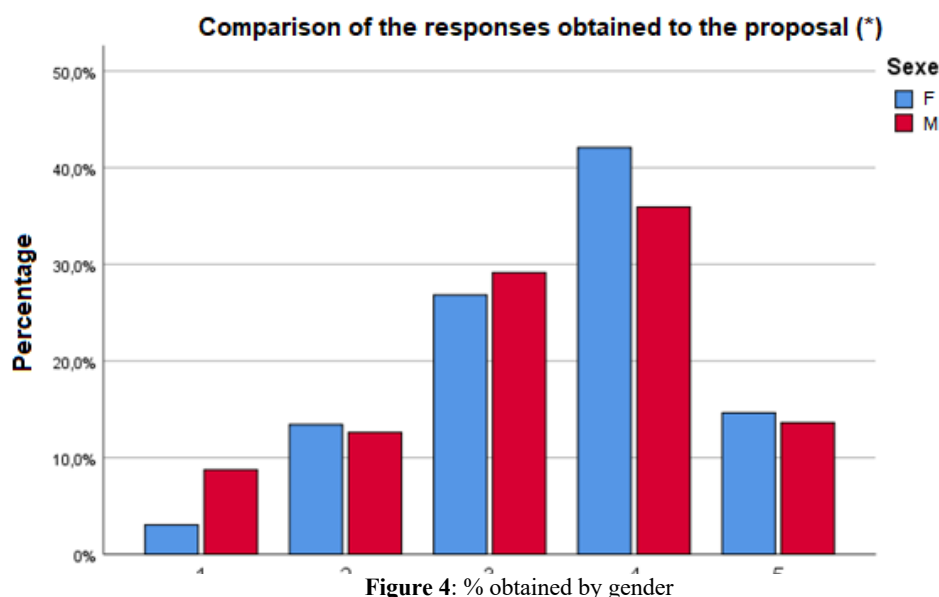
H ₀ : Boycotting a luxury brand due to environmental issues is independent to the gender of the respondents.
H ₁ : Boycotting a luxury brand due to environmental issues is related to the gender of the respondents.

To test this hypothesis, we first made a contingency table (Table 9) that gives the frequency for both men and women to the statement “*using blockchain I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable*”.

Table 9: Frequencies for boycotting a luxury brand for both men and women

Gender		1 = Strongly disagree	2 = Somewhat disagree	3 = Neither agree nor disagree	4 = Somewhat agree	5 = Strongly agree
Men	N	9	13	30	37	14
	%	3%	5%	11%	14%	5%
Women	N	5	22	44	69	24
	%	2%	8%	16%	26%	9%

Looking at the percentage of answers obtained by gender illustrated by Figure 4 it seems, at first glance, that the responses collected for men and women follow the same trend, i.e., both sexes appear to agree with the proposal. Therefore, women would not be more likely than men to boycott a brand that is not sufficiently committed to the environment.



However, this needs to be backed up with statistical tests. Appendix Statistical Outputs 5 shows the results from the chi-square test. The p-value it returns is greater than 0.05 which does not reject H_0 . We can conclude that there is no significant influence on gender on boycotting luxury brands that are not sufficiently committed to the environment.

Another interesting relationship to test is the effect of **age** on boycotting a luxury brand. Literature has shown that new generations of luxury consumers, Millennials and Gen Z, have different requirements and expectations. They are searching for more engaged and committed brands, seeking for greater transparency and meaningful values. Through literature, we have also learnt that 80% of luxury consumers prefer brands that are socially and environmentally responsible, but also that 51% of consumers think they should boycott retailers that do not act in an ethical manner. Moreover, with the “democratization of luxury”, luxury products became more accessible to a larger audience. As a result, it drove real consumers and especially the Millennials and Gen Z to upscale their purchase, in order to express themselves: to be unique and signal their status. A consequence of this “democratization of luxury” is the rise of sustainable behaviour to differentiate themselves from “excursionists”.

For all of the above reasons, we anticipate that the younger generations are more likely to boycott a luxury brand if blockchain gives them access to harmful environmental information.

H_0 : Boycotting a luxury brand due to environmental issues is independent to the age of the respondents.

H_1 : Boycotting a luxury brand due to environmental issues is related to the age of the respondents.

The dot plots (Appendix Statistical Outputs 6.1) provide a first visual analysis that was backed up with a Spearman correlation test, studying the influence of age on each of the three propositions that resulted in a p-value greater than 0.05 (Appendix Statistical Outputs 6.2). Therefore, the age exerts no influence, and we reject H_1 .

Then, we focused on the relationship **sustainable behaviour**-boycotting a luxury brand. Social psychology has shown that not all attitudes transform into behaviours. Indeed, there is a constant dilemma between attitude-behaviour in green consumption (Gupta & Ogden, 2009). Consumers of luxury goods may have concerns about environment (attitudes), but this concern does not translate into a change in purchase (behaviours) (Gupta & Ogden, 2009; Shrum, McCarty & Lowrey, 1995). Hence, we can hypothesise, that the more luxury consumers are active sustainable consumers, the more they will tend to boycott a brand after having transparency through blockchain about one of its products.

H_0 : Boycotting a luxury brand due to environmental issues is independent to the sustainable behaviour of the respondents.

H_1 : Boycotting a luxury brand due to environmental issues is related to the sustainable behaviour of the respondents.

The sustainable behaviour was measured with a 5-Likert scale on propositions regarding sustainable actions they undertake in their daily life, and the scores found for each of the ten propositions can be found in Appendix Statistical Outputs 7. Those variables will be grouped under one variable, which is the average of the scores for each proposition, what we will call “sustainable behaviour”.

To challenge this hypothesis, we first plotted the cloud diagram of the answers and then realised the correlation test focusing on the influence of “sustainable behaviour” on each of the three propositions (Appendix Statistical Outputs 8.1). The correlation test for the three propositions resulted in a p-value lower than 0.01, which RH_0 (Appendix Statistical Outputs 8.2). We can conclude that there is a very significant influence between “sustainable behaviour” and the

possibility of boycotting a brand, after having had access to unfavourable information regarding the environment via blockchain.

A last interesting relationship to test is whether boycotting a luxury brand when having access to information through blockchain unfavourable to the environment, is related or not to the importance respondents grant to **environmental practices when purchasing** luxury goods.

H_0 : Boycotting a luxury brand due to environmental issues is independent to the importance of environmental practices in the purchasing decision

H_1 : Boycotting a luxury brand due to environmental issues is related to the importance of environmental practices in the purchasing decision.

The p-value that the correlation test returned is lower than 0.01 which rejects the null hypothesis and confirms that boycotting a luxury brand due to environmental issues, is related to the importance of environmental practices in the purchasing decision (Appendix Statistical outputs 9).

6.2.3 Level of transparency and sectors

To gain more insights on future hypothetical behaviour with blockchain, two more hypothesis were tested; the level of information luxury consumers would want to have and the sector in which they are more likely to use blockchain, aiming at checking environmental information of the desired products.

The first relation that we will test is the **level of transparency** that consumers are searching for. The theoretical background showed that very little information exists regarding the level of transparency consumers of luxury goods are pursuing. Therefore, a question can be raised to know whether luxury consumers require transparency at every level of a product journey or only at a particular one. Literature has also shown that country of origin was, on the one hand, a significant characteristic of a luxury brand creating value for consumers and on the other hand, an important factor within purchasing decisions. As a result, we anticipate that between the three-levels identified by Keinan et al. (2020) (e.g., raw material, production process and

country of origin), the level of transparency and the information luxury consumers would seek through blockchain will be the country of origin.

Hypothesis: The level of transparency luxury consumers would want to have using blockchain relates to the country of origin

This hypothesis focuses on the question “*Knowing that the blockchain provides transparency about production chains of luxury companies, to what extent do you agree/disagree with the following statements?*”. A five-point Likert type scale was used for the proposition, as shown in Table 10.

Table 10: Frequency on the level of transparency

		1 = Strongly disagree	2 = Somewhat disagree	3 = Neither agree nor disagree	4 = Somewhat agree	5 = Strongly agree
I would use blockchain to get more information/transparency on the raw material used	N (=267)	7	15	38	121	86
	%	3%	6%	14%	45%	32%
I would use blockchain to get more information/transparency on the production process	N (=267)	7	15	49	129	67
	%	3%	6%	18%	48%	25%
I would use blockchain to get more information/transparency on the country of origin (“made-in”) of the product	N (=267)	6	10	33	111	107
	%	2%	4%	12%	42%	40%

In order to compare the responses to each proposal, and to test whether consumers are more likely to check country of origin information, we realised a boxplot (Appendix Statistical Output 10.1) to get a first indication of the responses’ breakdown. In addition to that, we conducted a pair-wise Student test to study the significance of the differences between each of the three statements (Appendix Statistical Outputs 10.2). The results in Appendix Statistical Outputs 10.2, show two things. First, the scores obtained for each proposal are significantly different from the others. While secondly, it allows us to confirm this hypothesis as the scores of the third proposal (e.g., on country of origin) are significantly higher than the scores of the other proposals. We conclude by rejecting H_1 .

Lastly, questions regarding the **sector** in which consumers are likely to use blockchain, demanding for transparency, can be raised. As the literature reported, the main environmental critics in the luxury sectors lies in issues such as animal treatment, fur leathers and raw material sourced from endangered species, we can ask ourselves whether leather bags and ready-to-wear are sectors in which luxury consumers would want to use blockchain in order to check environmental practices of the products.

Hypothesis: The willingness to use blockchain is independent from the sector in which luxury consumers would want to use it.

A Student test was realised to compare the scores for every sector. If the p-value obtained is lower than 0.05, we will conclude that there is a significant difference in scores between those who answered yes and those who did not. All the results obtained are shown in Table 11 below.

Table 11: p-value for each sector

Sector	Mean for “yes”	Mean for “no”	p-value
Mode	2,18	2,16	0,898
Leather goods	1,74	1,68	0,583
Cars	1,05	1,04	0,865
Jewellery	1,51	1,51	0,984
Watches	1,22	1,24	0,718
Perfumes	2,39	2,45	0,644
Cosmetics	2,41	2,47	0,717

As all p-values exceed 0,05, we can see that there is no influence on the utilization of blockchain for a specific sector.

6.3 Summary

Table 12 gathers the hypothesis that were tested along with the outcomes from the statistical analysis.

Table 12: Summary of the tested hypothesis

Hypothesis	Outcome
Hypothesis of the barrier	Potential identified barrier: trust

Hypothesis boycott related to past behaviour	Highly significant (p-value < 0.01)
Hypothesis boycott related to gender	Non-significant (p-value > 0.05)
Hypothesis boycott related to age	Non-significant (p-value > 0.05)
Hypothesis boycott related to sustainable behaviour	Highly significant (p-value < 0.01)
Hypothesis boycott related to environmental practices	Highly significant (p-value < 0.01)
Hypothesis on level of transparency	Level required country of origin
Hypothesis on sectors	No influence of the sector on the willingness to check environmental practices through blockchain

7. Discussions

This study reviewed on the one hand, what will drive luxury consumers to be willing to use blockchain, and on the other hand, the effects it would have on purchasing behaviour by conducting an elaborate literature analysis and collecting primary data. This section will discuss the findings from the practical analysis and compare it with the literature review.

7.1 The need for more transparency on environmental practices as a determinant to the willingness to use blockchain

The majority of the respondents answered favourably to the question regarding the willingness to use blockchain (55% “yes” compare to 8% of “no” and 37% “*I don’t know*”). The fact that many people also responded, “*I don’t know*”, probably reflects the fact that 34% of consumers did not know blockchain before undertaking this survey. To examine which factors influenced the “yes”, a logistic regression was operated. As a result, the only variable that was significant to predict the willingness to use blockchain was the variable “eco-practice 2”, i.e., the need for more transparency on environmental practices. The positive regression coefficient shows that the respondents’ demand for more transparency in environmental practices made them more likely more to be willing to use blockchain. On the one hand, this finding is interesting and positive as it means that luxury consumers would want to ensure that their desired luxury

products are ethically created. On the other hand, it is somewhat surprising when compared with the model, that it appears that socio-demographics, purchase frequency, the need for more transparency on quality and materials used, as well as the factors influencing the purchasing decision, are not significantly influencing our independent variable. One would expect that the need for transparency to ensure quality or the raw materials used would have played an important role. Indeed, luxury consumers value quality and pay attention to the fabrics, and are sometimes, less concerned by environmental practices.

Although, luxury consumers value authenticity and quality over environmental issues (Kapferer & Denizeau, 2017), this shows that with a tool providing transparency throughout supply chains, luxury consumers would pay more attention to environmental practices.

7.2 Blockchain as a solution for more sustainable behaviour

Different relationships were tested to determine when luxury consumers might boycott a luxury brand if the latter has not been acting “environmentally-friendly”. The paramount variable was *“using blockchain I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable”* and the tested variables were: *“past behaviour”* (i.e., if luxury consumers have already changed brands for environmental reasons), *“gender”*, *“age”*, *“sustainable behaviour”* (i.e., the day-to-day sustainable actions luxury consumers undertake), *“environmental practices”* (i.e., if luxury consumers take into account in their purchasing decisions, the environmental practices).

First, by examining the results of the test with the variable *“past behaviour”*, we can see that, if, at first glance, many people state that they would be inclined to boycott a luxury brand after having had access to unfavourable information regarding the environment, we can however notice that these are consumers who have already had this type of behaviour in the past, and have already switched luxury brands for environmental reasons before the introduction of the blockchain. This result makes sense on the one hand. Indeed, it seems logical that luxury consumers having already adopted this type of behaviour in the past, continue to act accordingly. On the other hand, as blockchain allows full transparency along supply chains within luxury companies, it could have been expected that despite no record of similar behaviours in the past, luxury consumers would change their purchasing behaviour.

Nevertheless, this could be explained by the brand attachment which is very strong in the luxury sector. Indeed, brands play a significant role in the purchasing decisions of luxury consumers, which may complicate the possibility of boycotting a luxury brand for environmental reasons compared to other sectors, where the brand attachment is not that strong.

The second relationship tested was with the variable “*gender*”. Although men are supposedly less sensitive to environmental problems than women according to Kapferer’s study (2017), it was observed that in this case with blockchain, both men and women would behave similarly. There is no difference between the two genders: men and women are willing to boycott a luxury brand after having had access to information through blockchain that are not environmentally favourable. Blockchain here is interesting as it may encourage men to consider environmental practices within luxury brands more carefully.

Thirdly, as literature has documented several times, the new generations of luxury consumers, i.e., Millennials and Gen Z, will display different sets of behaviour, taking much sustainability more into account, and expecting more transparency. Therefore, it seemed logical to test the influence of age on our variable. What appeared from the statistical tests was unexpected and counteracts the literature. Indeed, although these new generations seemed to be more sensitive to sustainability, there is however no correlation between age and the possibility of boycotting a brand after having had access to information through blockchain that are not environmentally friendly. It is difficult to understand that Generations Z and Millennials who claim to be more sustainability-oriented, do not see their purchasing behaviours change despite a tool that would allow them to have 100% transparency and access to environmental information of a product. Two possible explanations might lie behind this result. Either younger generations of luxury consumers are not as concerned by sustainability as the literature reported and hence, despite this tool providing full transparency, they would not be ready to boycott a brand for environmental reasons. Or, the result is quite positive, even if it does not confirm theoretical findings. It means that the possibility of switching brands for environmental reasons does not depend on the age. Therefore, older generations of luxury consumers might also take into account sustainability and would be ready to boycott a luxury brand. Perhaps the “sustainable” movement, despite the aspirations of younger generations of luxury consumers, which is well described in the literature, no longer relates to age but is gradually becoming part of the everyday life of the entire population.

The next relationship examined the influence of “*sustainable behaviour*” on boycotting a luxury brand. The purpose of this correlation was to analyse whether luxury consumers that act in a sustainable manner in their day-to-day life (e.g., using a bike for short distances, consuming local, etc.) might be more likely to boycott a luxury brand after having had access to information through blockchain that is not environmentally favourable. On the contrary, luxury consumers who had not adopted a “sustainable behaviour” in their daily lives would be less demanding with regards to the environmental information given by blockchain. The test confirmed the correlation of this relationship. At first glance, it makes sense since those who already expressed concerns towards sustainability would be likely to remain so. However, it makes a positive contribution to sustainable luxury. Indeed, despite the growing demand for transparency and sustainability, luxury consumers’ interest in sustainability remains relatively minimal in purchasing decisions. Moreover, literature has shown that people might be very sensitive towards the environment without translating it into actions, especially when it comes to luxury purchases (as those are less frequent). Therefore, it is interesting to observe that luxury consumers undertaking sustainable actions in their daily life, would expand it in their luxury purchases. Nevertheless, one would again have imagined that blockchain providing transparency on the product journey, enhancing environmental practices, would drive luxury consumers to consider more carefully environmental aspects.

This also applies to the “*environmental practices*” variable, since the population, taking into account the environmental practices in their purchasing decision, will take greater account of the information given by blockchain when making their purchasing decisions. For both findings (e.g., “*sustainable behaviour*” and “*environmental practices*”), we can suggest to luxury brands that if the sustainable trend is confirmed in the coming years, they will have to be aware that luxury consumers might adopt more and more sustainable behaviour, and at that point, be more likely to boycott a luxury brand when information through blockchain is not environmentally friendly.

7.3 Requirements from luxury consumers

In the questionnaire, luxury consumers were asked to indicate which level of transparency they would, and in which sectors (e.g., ready-to-wear, shoes, leather bags, jewellery, cars, watches, perfumes and cosmetics) they would be more likely to check products’ environmental impacts.

Findings regarding the level of transparency confirms what was documented in the literature; the country of origin has a significant importance for luxury consumers. Indeed, between the three proposals (e.g., raw materials used, production process and country of origin “made-in”), the results showed that the latter was the most important one. Therefore, we can observe that luxury consumers focus on the country of origin and do not seek for further information (e.g., raw materials used and production process) even if the information would be given by blockchain. To a certain extent, it is understandable as we have seen that it constitutes one of the characteristics of luxury brands. This result confirms for luxury brands, that the “made-in” remains an essential and decisive factor in the luxury consumers’ purchasing decision.

Finally, to go further, we wondered if luxury consumers would be more inclined to check environmental information for a particular sector. Indeed, critics within the luxury sector are mainly oriented towards fur controversy, animal testing, use of skin or else from endangered species, etc. Nevertheless, after analysis, no sectors emerged, as would have been expected. Therefore, consumers seem to put all sectors on an equal footing and the need for transparency on environmental practices is perceived throughout the luxury industry. Consequently, luxury brands in every industry should be careful, as it is not because they are not concerned with the current critics that they would be spared.

8. Conclusion

8.1 Conclusion of our study

This study investigated the factors that could influence consumers’ willingness to use blockchain and the effects it could have on luxury consumers’ purchasing behaviour. It was divided into two parts. First, a literature review was conducted in order to gain insights on the complex tool of blockchain and to better understand the luxury sector, its characteristics, its market and its link to sustainability. Despite different opinions on whether luxury is sustainable or not, almost every author agreed that non-compliance towards sustainability is no longer an option. Indeed, if luxury sectors have long been spared by this movement, which focused primarily on fast fashion, then sustainability requests also extended to this sector. Over the past few years, we have seen many companies investing in sustainability, promoting green products

or even creating an entire brand on environmental values, such as Stella McCartney who uses vegan leather, refusing to source from animals. In addition to that, practical application of blockchain within this sector was outlined. Blockchain could enhance sustainable practices when applied within supply chains by providing transparency and traceability of products. The second part was dedicated to the collection of primary data by means of an online survey to answer our research questions. The questionnaire assessed luxury consumers' willingness to use blockchain and the potential change in purchasing behaviour related to the implementation of this tool.

Results show that the need of transparency within environmental practices significantly influences the willingness to use blockchain. On the contrary, factors such as the need of transparency on quality, or the determinants in luxury consumers' purchasing decisions are not per se indicators of the willingness to use blockchain, as one would think.

This study also questioned whether the implementation of blockchain would affect luxury buyers and if it would compel them to consider environmental practices when buying luxury products. Findings illustrated that despite the ability of accessing full transparency of the product journey, in most cases, the possibility of boycotting a luxury brand when information was not environmentally favourable depends either on the past behaviour or the sustainable behaviour of the luxury consumers. Therefore, we can observe that there is a strong connection between being already concerned or acting in a sustainable manner, with the possibility of boycotting luxury brands for environmental reasons.

Based on these results, the question can be raised whether blockchain is an adequate solution to enhance sustainability within supply chains of luxury brands and encourage luxury consumers to take more into account environmental practices, and even moving away from their favourite luxury brands to those which are more committed. However, while it is understandable that consumers continue to order luxury products based on other factors than environmental practices, because - today - they do not have 100% transparency, it is nevertheless difficult to understand that these consumers might not adapt their purchase behaviour when blockchain gives all the information necessary for making informed choices.

8.2 Limitations

This paper tried to be as complete and extensive as possible on the research questions, “*What influences luxury consumers’ willingness to use blockchain and how could it impact consumers’ purchase behaviour*”. However, the conclusion might encounter limitations due to the need for a master thesis to be concise. Acknowledging this enables better insights into the contributions this project delivers. Understanding the limitations of this study might lead to new perspectives for future studies.

First, the online questionnaire was mainly answered by individuals from Western countries. This might prevent our results from being generalized to the population of luxury consumers, as the literature emphasizes the difference of sustainability engagement between countries. Individuals from Western countries are usually more likely to engage in sustainability than from the upper middle class in emerging countries or “new rich”.

Second, as we have seen in the literature, luxury is a complicated concept that can be subjective and varies from a person to person. Therefore, some respondents may have a different meaning than what we thought might have been undertaken in this survey. This relates to the problem of the snowball sampling method, as the researcher does not have control over the sample, which was at first influenced by the closed circles around the researcher.

Third, one important limit to take into account when interpreting those results is that this paper aims at testing hypothetical future behaviour with a tool that most of the respondents have or little knowledge of. As a result, even if it brings an initial insight and contributes to literature on the subject of sustainability, blockchain and luxury sector, it should not be considered indisputable or definitive.

Fourth, social desirability bias might have occurred when answering the survey to questions relating to sustainable behaviour or intentions. Indeed, it sometimes happens that respondents want to “look good” even if the questionnaire is anonymous, and therefore answer favourably to questions on environmental behaviour, mildly overstating it.

Fifth, the concept of transparency is sometimes wrongly associated to sustainability. Transparency allows the stakeholders, NGOs, governments, etc. to collaborate and improve the adopted sustainable measures, but transparency does not relate by definition to sustainability. However, when the respondents were asked to what extent they agreed with the following proposition *“in my opinion, the companies that would use the blockchain would therefore be “eco-friendlier” as a result”*, 61.8% agreed to that proposition.

Finally, the pandemic crisis prevented the ability of diversifying the sample selected. Indeed, in order to avoid the limit of “luxury definition” and to increase the number of participants, we planned to go to luxury boutiques asking for clients to answer the survey. However, this was been hampered with the onset of the crisis.

8.3 Research perspectives

This research provided a rich understanding of the luxury sector, its specificities and how transparency through blockchain could impact this sector. However, while environmental practices constitute major critics towards the luxury sector, the social practices should not be underestimated. Hence, future research could tackle the social issues. Moreover, future research could also combine both environmental and social parts in order to argue on what consumers really value or feel more sensitive about. This complementary analysis could provide valuable information for luxury brands to better understand the real need individuals feel for transparency.

Another aspect that should be exploited is the factors influencing a company to invest in blockchain. Despite all the great advantages this technology can bring, literature showed that blockchain has limitations that could prevent firms from implementing it. Within the luxury sector we could ask ourselves whether fighting counterfeit and ensuring authenticity are the main drivers within the risk of compromising the worship of secrecy.

For organizations having already invested in this technology, several research studies could be interesting to conduct. First, the efficiency blockchain can bring to supply chains could be examined, as well as how it can change relationships to other stakeholders. As blockchain requires a collaboration between stakeholders, a question can be raised to know whether it has

changed the culture of enterprise. In the same way, study could examine whether firms that have invested in blockchain within their supply chain resulted in the selection of more sustainable suppliers.

The suggestions here above prove that this topic still needs in-depth analysis. A multitude of research can still be conducted in order to develop greater knowledge and understanding.

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Appendix

I. Survey outline

1. Online questionnaire

English (United Kingd...

Thesis Survey

Dear Madam, Sir

As part of my final thesis in business administration at the Louvain School of Management (LSM), I am conducting a survey in which your participation would be very valuable to me.

The aim of this survey is to analyse how the purchasing behaviour of luxury product consumers (perfume & cosmetics, cars, fashion & leather goods, watches & jewellery), even occasional, could be impacted by the use of a tool, blockchain, that allows more transparency throughout the production chain.

This form will take you between 5 and 10 minutes. Thank you for answering it as honestly and spontaneously as possible.

By completing this form, you accept that your answers will be recorded in a database and that they will be analysed in a totally anonymous way.

Thank you for your participation!

Florianne Steimes (florianne.steimes@student.uclouvain.be), Master's student at the Louvain School of Management (LSM).

* Required

PART 1: Questions about your luxury shopping behaviour

1. Are you a consumer of luxury goods (even occasional)? *

☐ Yes

☐ No

Next

2. How often do you purchase the following luxury products? *

	Very rarely (less than once a year)	Rarely (once or twice a year)	Occasionally (several times a year)	Often (once a month)	Very often (several times a month)
Ready-to-wear	☐	☐	☐	☐	☐
Shoes	☐	☐	☐	☐	☐
Leather goods	☐	☐	☐	☐	☐
Cars	☐	☐	☐	☐	☐
Jewellery	☐	☐	☐	☐	☐
Watches	☐	☐	☐	☐	☐
Perfumes	☐	☐	☐	☐	☐
Cosmetics	☐	☐	☐	☐	☐

3. When purchasing luxury goods, the following elements play an important role in your purchase decision:

(Indicate your agreement/disagreement on the following) *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Raw materials used	☐	☐	☐	☐	☐
The manufacture of the product (craftsmanship/know-how)	☐	☐	☐	☐	☐
The impact of materials on the environment/animals	☐	☐	☐	☐	☐
Pollution from production process	☐	☐	☐	☐	☐
Substances added during the production of the product	☐	☐	☐	☐	☐
The origin of the product ("made-in")	☐	☐	☐	☐	☐

4. To what extent are you attached to a specific brand for the following sector: *

	Not at all committed - I buy according to the product, not the brand	Slightly committed - I buy products from different brands	No opinion	Committed - I often buy products of the same brand	Very committed - I always buy products of the same brand
Ready-to-wear	☐	☐	☐	☐	☐
Shoes	☐	☐	☐	☐	☐
Leather goods	☐	☐	☐	☐	☐
Cars	☐	☐	☐	☐	☐
Jewellery	☐	☐	☐	☐	☐
Watches	☐	☐	☐	☐	☐
Perfumes	☐	☐	☐	☐	☐
Cosmetics	☐	☐	☐	☐	☐

5. To what extent have you adapted your consumption habits of luxury goods for environmental reasons?

(Indicate your agreement/disagreement) * 

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have already decided to boycott a luxury brand that has not taken enough environmental action on at least one of its products	☐	☐	☐	☐	☐
I have already decided to buy a similar product from another luxury brand that has taken more environmental measures than the brand I usually appreciate.	☐	☐	☐	☐	☐
I have always remained loyal to my favourite luxury brand and have not changed my purchasing behaviour, no matter what information I have about the environmental practices of my brand or competing brands.	☐	☐	☐	☐	☐

PART 2: Questions about your behaviour in relation to the environment

6. Indicate whether you consciously apply the following practices in your daily life: *

	Never	Sometimes	Regularly	Often	Always
Pay attention to water and energy consumption	☐	☐	☐	☐	☐
Sorting waste	☐	☐	☐	☐	☐
Buy seasonal fruits and vegetables	☐	☐	☐	☐	☐
Buying products with an ecolabel or fair-trade label	☐	☐	☐	☐	☐
Walking or biking for short distances	☐	☐	☐	☐	☐
Doing volunteer work in a nature and environmental protection organisation	☐	☐	☐	☐	☐
Financial support for a nature and environmental organisation	☐	☐	☐	☐	☐
Avoid plastic packaging	☐	☐	☐	☐	☐
Buying local products	☐	☐	☐	☐	☐
Avoiding food waste	☐	☐	☐	☐	☐

PART 3: Questions about transparency with blockchain

Blockchain is a database shared among several users, members of the same network (in our case, a production and supply chain), on which are stored the records of all transactions and information that have been executed and shared among its users since its creation. Each record contained in this database is verified by consensus of the majority of system participants. Once entered, the information cannot be erased because each block contains a certain and verifiable history of the transactions carried out. Successive exchanges made by users are recorded on this database in the form of blocks of transactions (hence the name Blockchain).

Throughout the product lifecycle, the actors in the production and supply chain enter information about the products they produce, process or distribute into Blockchain. At the end of the cycle, the consumer can, by scanning a QR code, retrieve all the information about his product.

This tool is:

DECENTRALIZED – Blockchain operates without a central control unit. Each member of the network can check the validity of the information and add data.

SECURE - Each modification made to the database must be approved and verified by the network members. This advantage strongly limits fraud but is not immune to potential cyber-attacks.

GUARANTEED TRANSPARENT TRACEABILITY - It allows to have the information of a product at its different stages of production, transformation and marketing

7. Before reading the above description, were you familiar with blockchain? *

- ☐ Yes
- ☐ No, I discovered it when I read the explanation

8. When purchasing luxury goods, I would like to have more transparency and information to ensure the following:
(Indicate your agreement/disagreement) *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Raw materials used	☐	☐	☐	☐	☐
The manufacture of the product (craftsmanship/know-how)	☐	☐	☐	☐	☐
The impact of materials on the environment/animals	☐	☐	☐	☐	☐
Pollution from production process	☐	☐	☐	☐	☐
Substances added during the production of the product	☐	☐	☐	☐	☐
The origin of the product ("made-in")	☐	☐	☐	☐	☐
The routing of the product	☐	☐	☐	☐	☐

9. To what extent do you agree/disagree with the following statements: *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
From what I understood about blockchain, this tool would allow me to have more transparency about production lines of luxury houses.	☐	☐	☐	☐	☐
In my opinion, the companies that would use the blockchain would therefore be «eco-friendlier» as a result.	☐	☐	☐	☐	☐

PART 4: Questions about your future buying intentions with blockchain

10. If luxury brands implemented the blockchain, would you use it when purchasing luxury goods? *

- ☐ Yes
- ☐ No
- ☐ I don't know

11. Why wouldn't you use it ?

(Indicate your agreement/disagreement with the following) *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
USE – This tool seems too complex to me	☐	☐	☐	☐	☐
NECESSITY – I do not feel the need for such a tool	☐	☐	☐	☐	☐
TRUST – I do not think I can trust the data	☐	☐	☐	☐	☐

12. Using blockchain, I would check the environmental practices for the following sectors: *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Ready-to-wear	☐	☐	☐	☐	☐
Shoes	☐	☐	☐	☐	☐
Leather goods	☐	☐	☐	☐	☐
Cosmetics	☐	☐	☐	☐	☐
Perfumes	☐	☐	☐	☐	☐
Cars	☐	☐	☐	☐	☐
Jewellery	☐	☐	☐	☐	☐
Watches	☐	☐	☐	☐	☐

13. Knowing that the blockchain provides transparency about production chains of luxury companies, to what extent do you agree/disagree with the following statements? *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I would use blockchain to get more information/transparency on the raw materials used	☐	☐	☐	☐	☐
I would use blockchain to get more information/transparency on the production process	☐	☐	☐	☐	☐
I would use blockchain to get more information/transparency on the country of origin ("made-in") of the product	☐	☐	☐	☐	☐

14. If luxury companies were implementing blockchain, indicate to what extent you agree/disagree with the statements below: *

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Using blockchain, I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable.	☐	☐	☐	☐	☐
Using blockchain, I would buy a comparable product of the same brand for which the information on environmental practices is more favourable.	☐	☐	☐	☐	☐
With the blockchain tool I would buy a comparable product from a competitor's brand for which the information on environmental practices is more favourable.	☐	☐	☐	☐	☐

PART 5: Personal characteristics

15. Are you: *

- ☐ A man
- ☐ A woman
- ☐ Prefer not to mention

16. What is your country of residence? *

17. How old are you? *

18. What is your highest-level diploma? *

- ☐ No diploma
- ☐ Secondary school
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Doctorate

19. What is your socio-professional category? *

- ☐ Farmer, landholder
- ☐ Craftsman, trader
- ☐ Executive, senior management
- ☐ Liberal professions
- ☐ Employee
- ☐ Worker
- ☐ Student
- ☐ Retired
- ☐ Unemployed

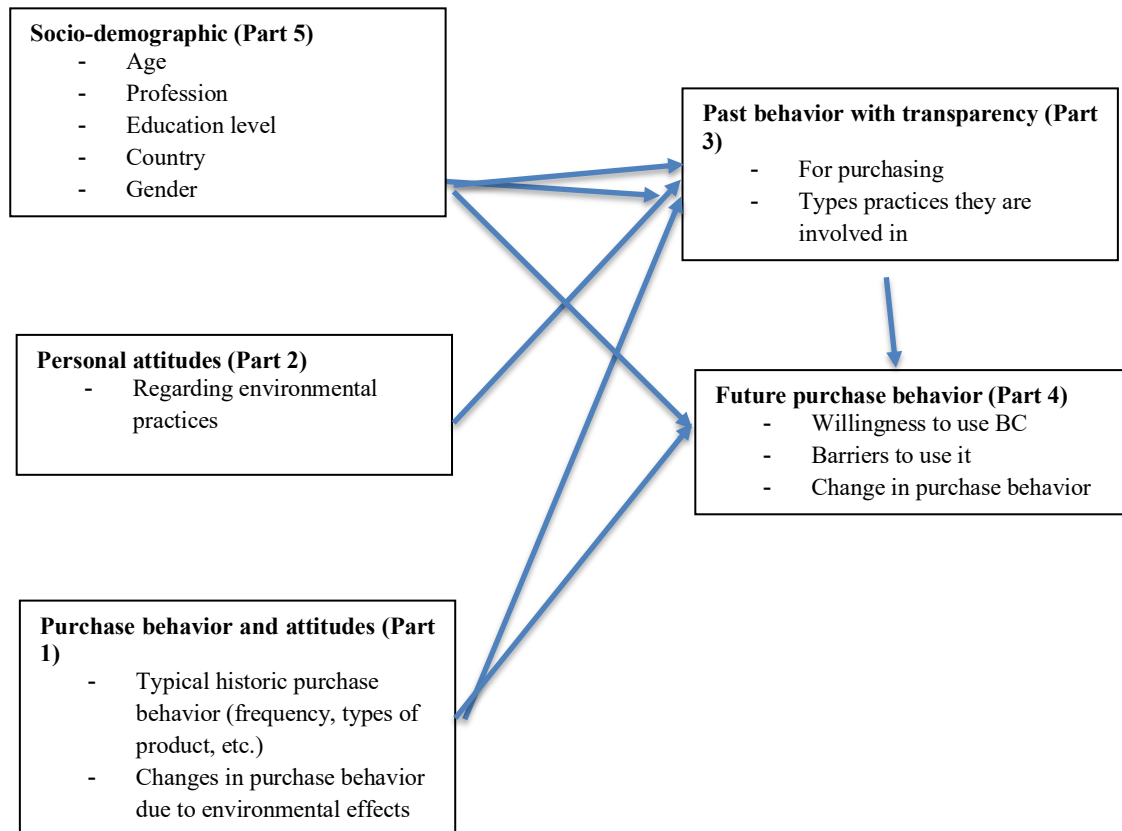
20. Thank you very much for your participation! As stated at the beginning of the survey, the data will be treated anonymously and confidentially.

As we need as many answers as possible, do not hesitate to share this questionnaire with your acquaintances who would consume luxury products.

If you are interested in the results of this survey, you can leave your email address below so that I can communicate the results to you.

Enter your answer

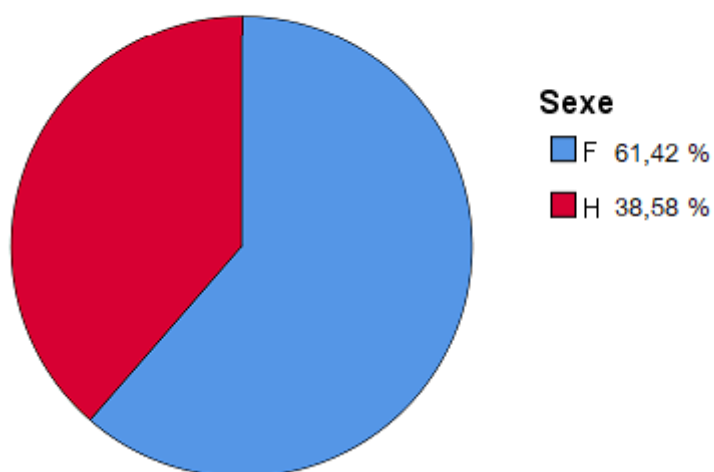
2. Survey framework



3. Sample description

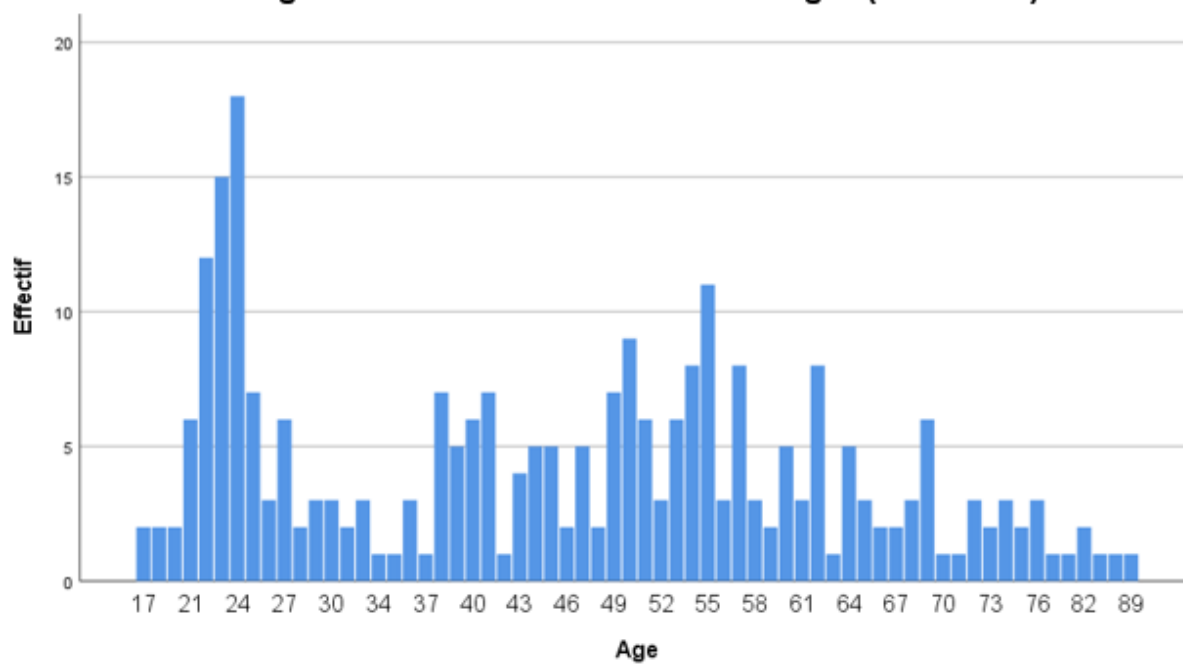
3.1 Gender

Diagramme circulaire de la répartition des sexes

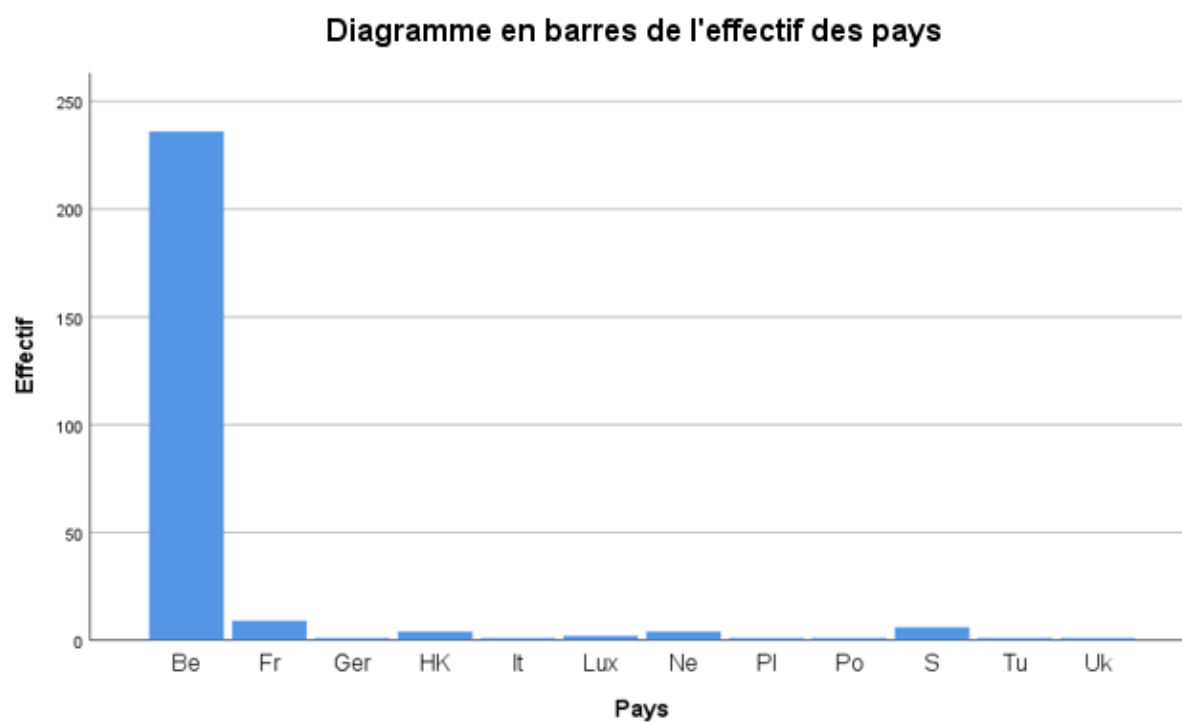


3.2 Age

Diagramme en barres de l'effectif des âges (en années)



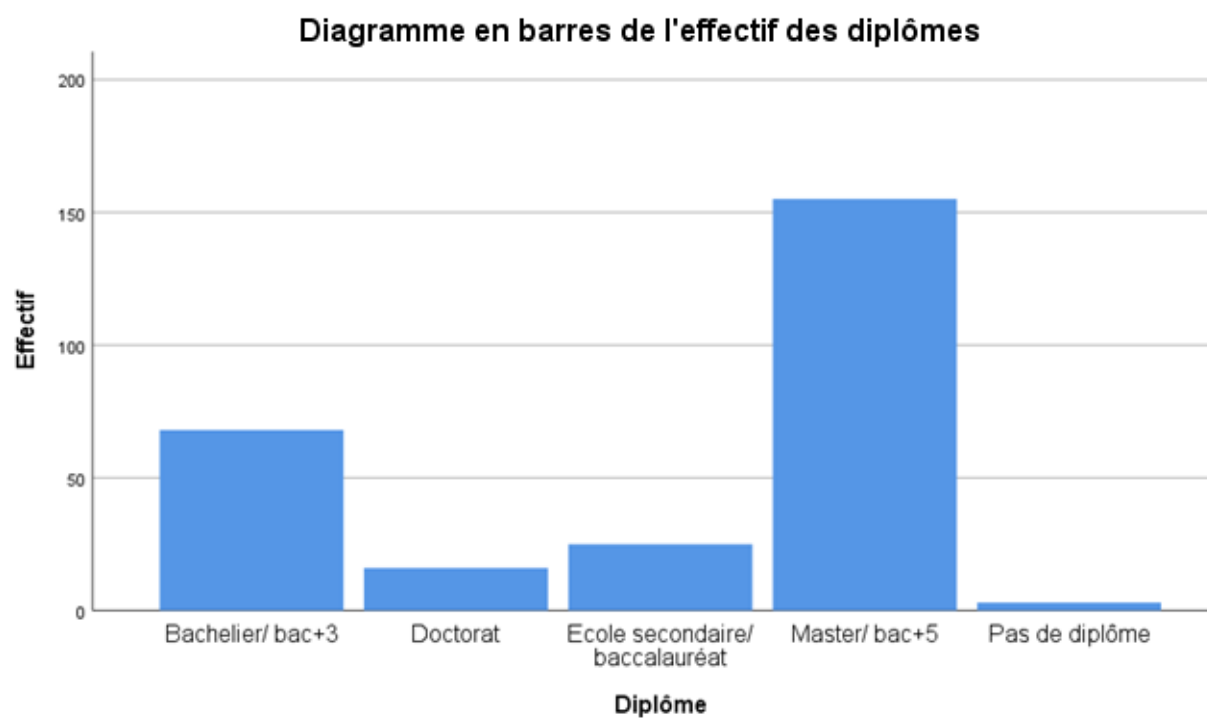
3.3 Country of residence



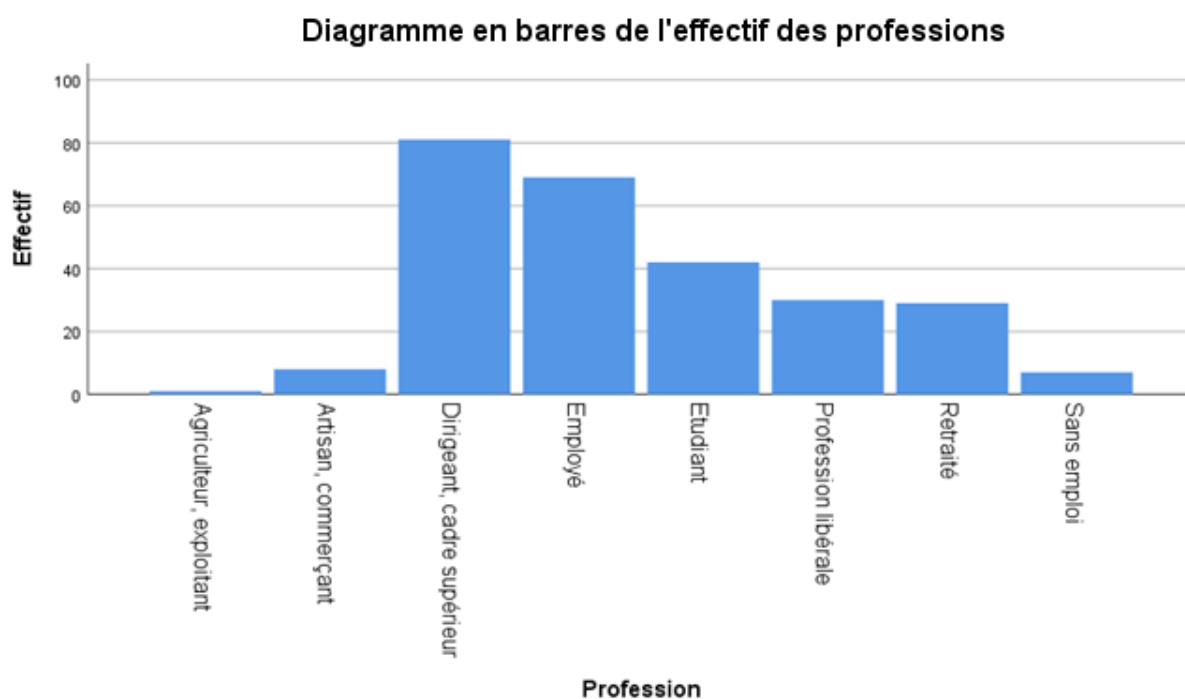
Legend:

Country	Abbreviation	Frequency
Belgium	Be	236
France	Fr	9
Germany	Ger	1
Hong-Kong	HK	4
Italy	It	1
Luxembourg	Lux	2
Holland	Ne	4
Poland	Pl	1
Portugal	Po	1
Switzerland	S	6
Turkey	Tu	1
Ukraine	Uk	1

3.4 Level of education



3.4 Profession



II. Statistical outputs

1. Statistical theory

Spearman correlation. The first step was to plot the dot cloud corresponding to the studied variables which allows us to have a visual overview of a possible relationship between these variables. After that, the Spearman correlation coefficient which measures the degree of dependence between two variables X and Y was computed with the formula below (Wackerly, 2008):

$$\rho = \frac{Cov(r_{g_X}, r_{g_Y})}{\sigma_{r_{g_X}} \sigma_{r_{g_Y}}}$$

With $Cov(r_{g_X}, r_{g_Y})$ being is the covariance between variables of X and Y and $\sigma_{r_{g_X}}$ and $\sigma_{r_{g_Y}}$ are the standard deviations of the variables X and Y respectively. The correlation coefficient range between -1 and 1. When it is closed to 1, it means that the variable has a strong positive influence on the other, while when it is closed to -1, it has a negative influence. When no influence exists among variables, the coefficient will be closed to 0 (Wackerly, 2008). Let the null hypothesis (H0) and the alternative hypothesis (H1) be respectively:

H₀ : the two variables are not associated ($\rho = 0$)

H₁ : there is a relationship between the two variables

The p-value of the correlation test, noted p , will be compared to a risk level α (whose value is set at 0.05) and will inform us about the significance of the relationship between the two variables:

$p > 0,05$: No rejection of H₀: the relationship between the two variables is non-significant (NS).

$p \leq 0,05$: Rejection of H₀: the relationship between the two variables is significant (S).

$p \leq 0,01$: Rejection of H_0 : the relationship between the two variables is highly significant (HS).

Chi-square. Some hypothesis required to test two groups of variables (e.g. women-men) which need the use of the Chi-square test. This test is used to test the null hypothesis stating that there is no relationship between two categorical variables. It compares the frequencies obtained (for each response item in our case) between groups.

H_0 : No relationship between two categorical variables
H_1 : there is a relationship between the two categorical variables

For a p-value given by the test, the decision rule will then be as follows:

$p > 0,05$: No rejection of H_0 : belonging to any group does not significantly influence an individual's response (NS).

$p \leq 0,05$: Rejection of H_0 : belonging to any group significantly influences an individual's response (S).

$p \leq 0,01$: Rejection of H_0 : belonging to any group has a highly significant influence on an individual's response (HS).

2. Logistic regression

Variables absentes de l'équation

			Score	ddl	Sig.
Pas 1	Variables	Mode	,278	1	,598
		Maroquinerie	1,380	1	,240
		Voiture	,220	1	,639
		Bijoux	,186	1	,666
		Montre	,127	1	,722
		Parfums	,033	1	,857
		Cosmétique	,148	1	,700
		Qualité	2,972	1	,085
		Eco-pratique	,329	1	,566
		Traçabilité	1,208	1	,272
		Eco-consommateur	,134	1	,714
		Connaissais blockchain (1)	1,886	1	,170
		Qualité2	,369	1	,544
		Sexe(1)	,200	1	,654
		Age	,890	1	,346
		Diplôme	1,771	1	,183
	Statistiques générales		13,163	17	,725

Variables de l'équation

		B	E.S	Wald	ddl	Sig.	Exp(B)
Pas 1 ^a	Eco-pratique2	1,007	,188	28,634	1	,000	2,736
	Constante	-3,970	,797	24,797	1	,000	,019

a. Introduction des variables au pas 1 : Eco-pratique2.

Table de classification

			Prévisions		
			Si les marques de luxe implémentaient la blockchain, l'utiliserez-vous lors de vos achats de produits de luxe ?		Pourcentage correct
Observé			0	1	
Pas 1	Si les marques de luxe implémentaient la blockchain, l'utiliserez-vous lors de vos achats de produits de luxe ?	0	52	68	43,3
		1	17	130	88,4
Pourcentage global					68,2

3. Barriers to willingness to use blockchain

3.1 Descriptive statistics

Statistiques descriptives					
	N	Minimum	Maximum	Moyenne	Ecart type
UTILISATION - Cet outil me paraît trop complexe	120	1	5	3,41	,884
NECESSITE - Je ne ressens pas le besoin pour un tel outil	120	1	5	3,47	,925
CONFIANCE - je ne pense pas pouvoir faire confiance aux données	120	1	5	3,09	1,138
N valide (liste)	120				

3.2 Student test

Test des échantillons appariés

		Différences appariées							
		Moyenne	Ecart type	Moyenne erreur standard	Intervalle de confiance de la différence à 95 %		t	ddl	Sig. (bilatéral)
					Inférieur	Supérieur			
Paire 1	UTILISATION - Cet outil me paraît trop complexe - NECESSITE - Je ne ressens pas le besoin pour un tel outil	-,058	1,117	,102	-,260	,144	-,572	119	,569
Paire 2	CONFIANCE - je ne pense pas pouvoir faire confiance aux données - UTILISATION - Cet outil me paraît trop complexe	-,317	1,277	,117	-,547	-,086	-2,717	119	,008
Paire 3	NECESSITE - Je ne ressens pas le besoin pour un tel outil - CONFIANCE - je ne pense pas pouvoir faire confiance aux données	,375	1,244	,114	,150	,600	3,302	119	,001

4. Correlation test boycott – boycott in the past

Corrélations

			Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Boycot car pas eco	Changer marque car plus eco	Fidélité marque pref
Rho de Spearman	Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Coefficient de corrélation	1,000	,621**	,635**	,437**	,393**	-,276**
		Sig. (bilatéral)	.	,000	,000	,000	,000	,000
		N	267	267	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,621**	1,000	,810**	,470**	,462**	-,272**
		Sig. (bilatéral)	,000	.	,000	,000	,000	,000
		N	267	267	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,635**	,810**	1,000	,485**	,490**	-,263**
		Sig. (bilatéral)	,000	,000	.	,000	,000	,000
		N	267	267	267	267	267	267
	Boycot car pas eco	Coefficient de corrélation	,437**	,470**	,485**	1,000	,796**	-,422**
		Sig. (bilatéral)	,000	,000	,000	.	,000	,000
		N	267	267	267	267	267	267
	Changer marque car plus eco	Coefficient de corrélation	,393**	,462**	,490**	,796**	1,000	-,462**
		Sig. (bilatéral)	,000	,000	,000	,000	.	,000
		N	267	267	267	267	267	267
	Fidélité marque pref	Coefficient de corrélation	-,276**	-,272**	-,263**	-,422**	-,462**	1,000
		Sig. (bilatéral)	,000	,000	,000	,000	,000	.
		N	267	267	267	267	267	267

** La corrélation est significative au niveau 0.01 (bilatéral).

5. Chi-square test boycott – gender

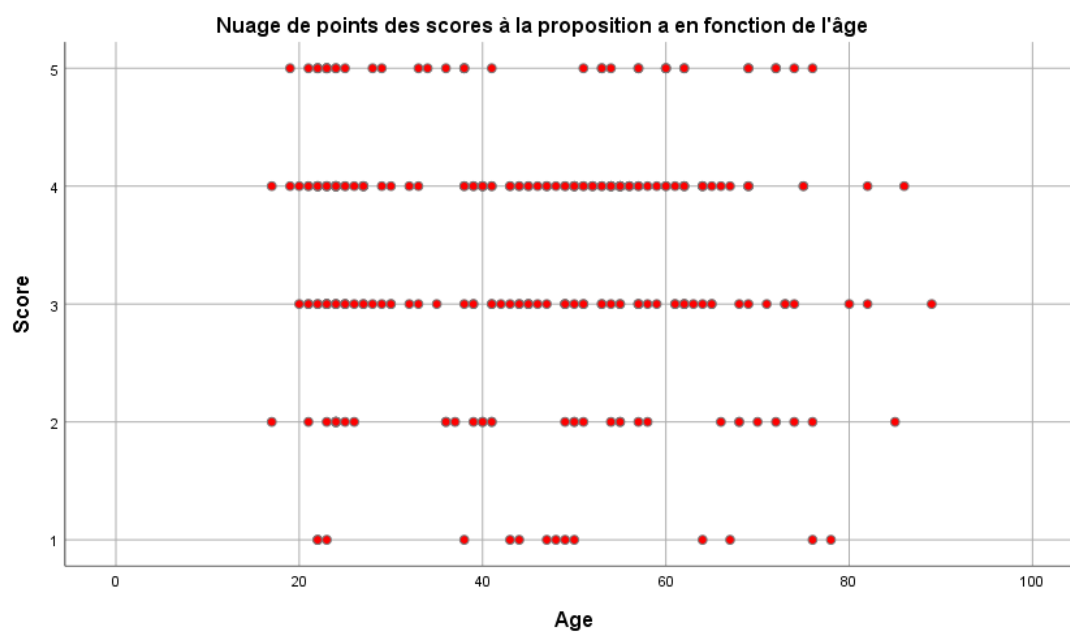
Tests du khi-carré			
	Valeur	ddl	Signification asymptotique (bilatérale)
khi-carré de Pearson	4,707 ^a	4	,319
Rapport de vraisemblance	4,579	4	,333
N d'observations valides	267		

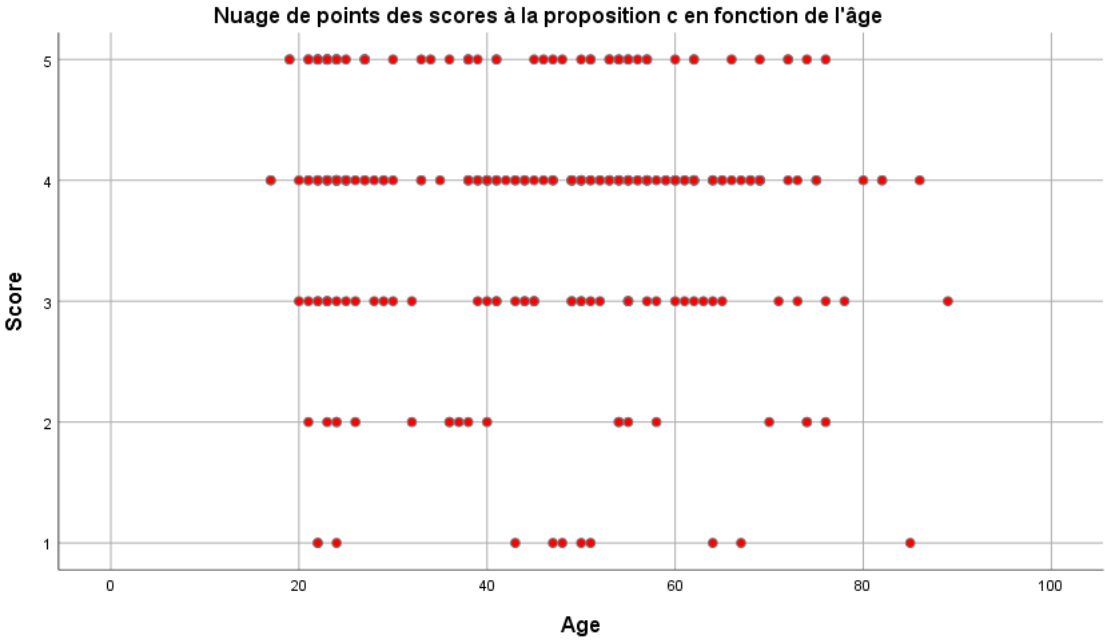
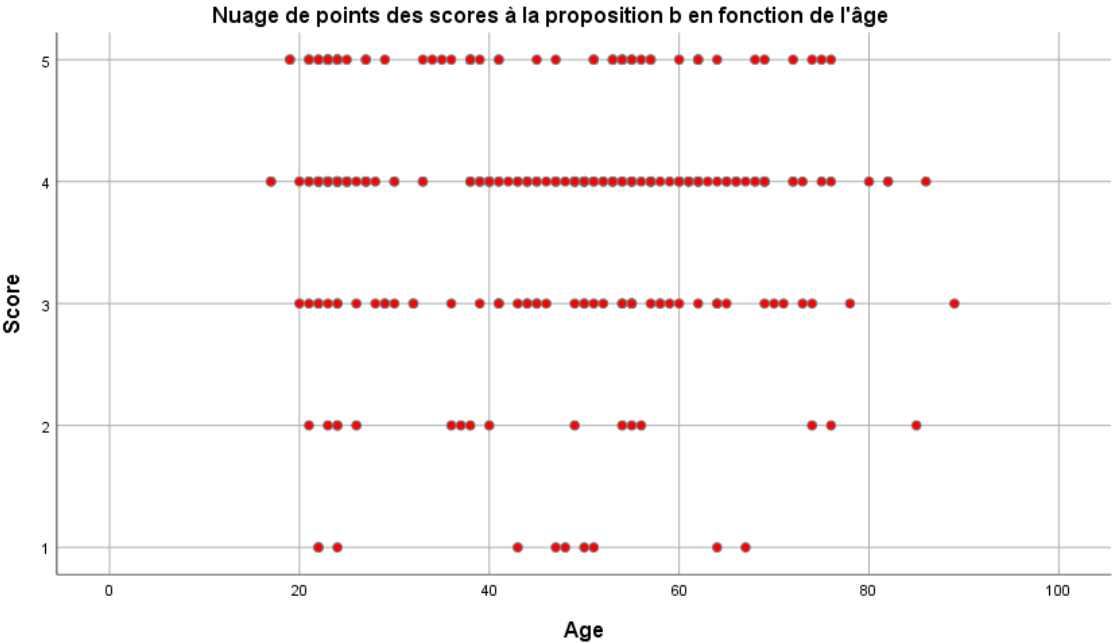
a. 0 cellules (0,0%) ont un effectif théorique inférieur à 5.
L'effectif théorique minimum est de 5,40.

6. Correlation test boycott – age

6.1 Dot plots

- Using blockchain, I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable.
- Using blockchain, I would buy a comparable product of the same brand for which the information on environmental practices is more favourable.
- With the blockchain tool I would buy a comparable product from a competitor's brand for which the information on environmental practices is more favourable.





6.2 Correlation test

		Somme des carrés	ddl	Carré moyen	F	Sig.
Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Intergruppes	4,769	5	,954	,883	,493
	Intragruppes	271,262	251	1,081		
	Total	276,031	256			
Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Intergruppes	2,141	5	,428	,452	,812
	Intragruppes	237,929	251	,948		
	Total	240,070	256			
Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Intergruppes	2,090	5	,418	,420	,835
	Intragruppes	249,980	251	,996		
	Total	252,070	256			

7. Sustainable behaviour' scores

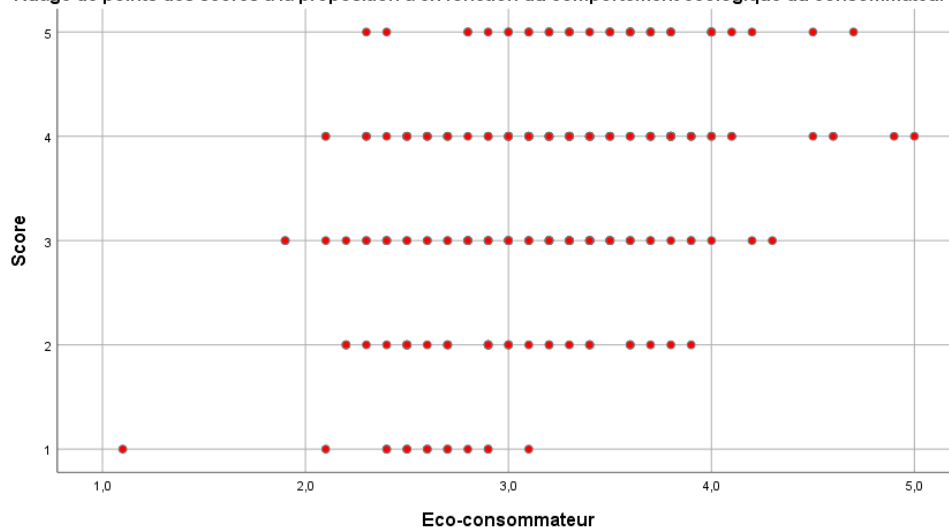
Item	Never	Rarely	Sometimes	Often	Always
Pay attention to water and energy consumption	4	32	58	96	77
Sorting waste	3	8	29	49	178
Buy seasonal fruits and vegetables	2	23	60	127	55
Buying products with an ecolabel or fair-trade label	11	78	61	95	22
Walking or biking for short distances	22	80	62	73	30
Doing volunteer work in a nature and environmental protection organisation	204	47	6	7	3
Financial support for a nature and environmental organisation	115	100	24	19	9
Avoid plastic packaging	11	71	73	85	27
Buying local products	6	42	78	117	24
Avoiding food waste	3	22	49	99	94

8. Correlation test boycott – sustainable behaviour

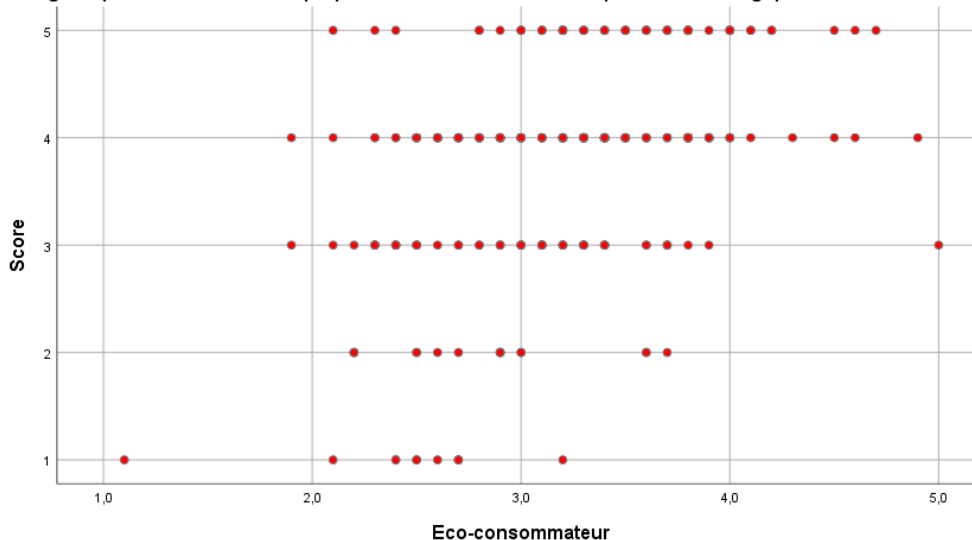
8.1 Dot plots

- Using blockchain, I would boycott a luxury brand if for at least one of its products the information on environmental practices was unfavourable.
- Using blockchain, I would buy a comparable product of the same brand for which the information on environmental practices is more favourable.
- With the blockchain tool I would buy a comparable product from a competitor's brand for which the information on environmental practices is more favourable.

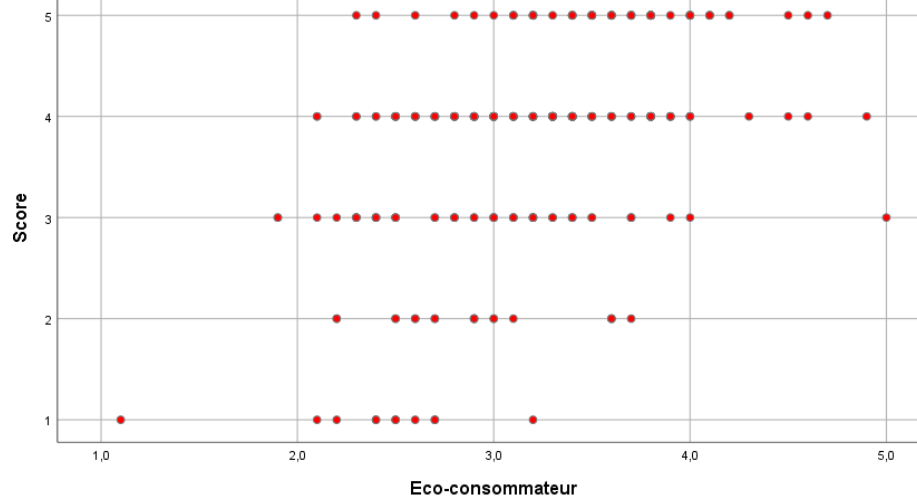
Nuage de points des scores à la proposition a en fonction du comportement écologique du consommateur



Nuage de points des scores à la proposition b en fonction du comportement écologique du consommateur



Nuage de points des scores à la proposition c en fonction du comportement écologique du consommateur



8.2 Correlation tests

Corrélations

			Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Eco-consommateur
Rho de Spearman	Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Coefficient de corrélation	1,000	,621**	,635**	,385**
		Sig. (bilatéral)	.	,000	,000	,000
		N	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,621**	1,000	,810**	,420**
		Sig. (bilatéral)	,000	.	,000	,000
		N	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,635**	,810**	1,000	,474**
		Sig. (bilatéral)	,000	,000	.	,000
		N	267	267	267	267
	Eco-consommateur	Coefficient de corrélation	,385**	,420**	,474**	1,000
		Sig. (bilatéral)	,000	,000	,000	.
		N	267	267	267	267

** . La corrélation est significative au niveau 0.01 (bilatéral).

9. Correlation test boycott – environmental factors in purchasing decision

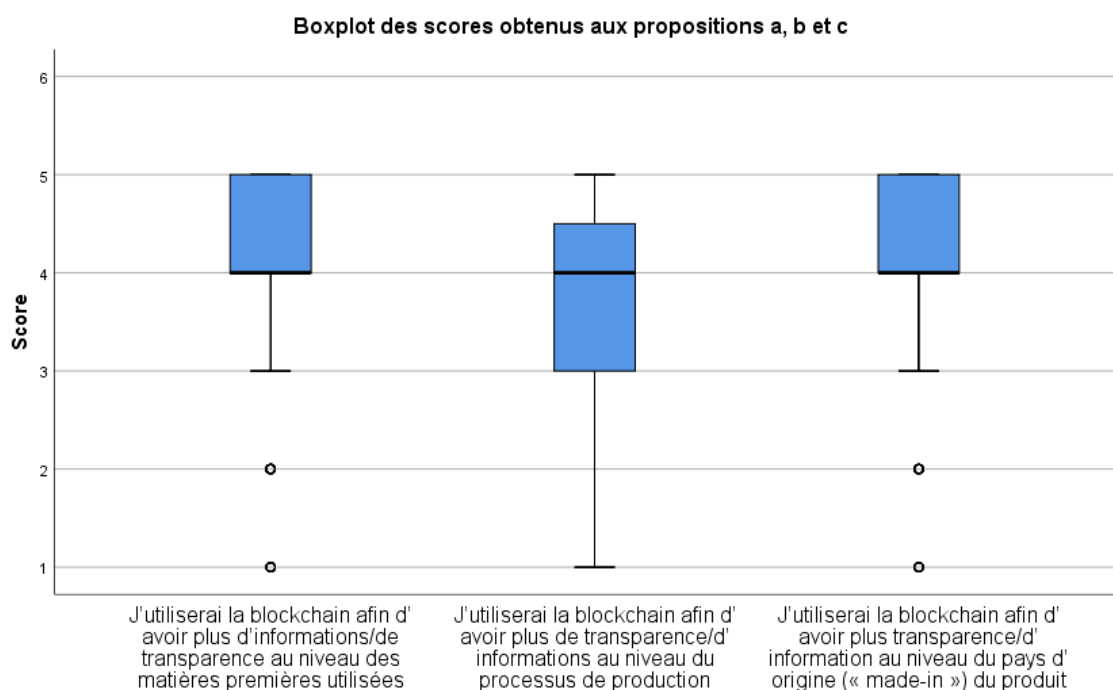
Corrélations								
			Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Qualité	Eco-pratique	Traçabilité
Rho de Spearman	Avec l'outil de la blockchain je pourrais boycotter une marque de luxe si pour au moins un de ses produits, les informations relatives aux pratiques environnementales étaient défavorables.	Coefficient de corrélation	1,000	,621**	,635**	,172**	,319**	,148*
		Sig. (bilatéral)	.	,000	,000	,005	,000	,015
		N	267	267	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable de la même marque pour lequel les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,621**	1,000	,810**	,205**	,351**	,200**
		Sig. (bilatéral)	,000	.	,000	,001	,000	,001
		N	267	267	267	267	267	267
	Avec l'outil de la blockchain j'achèterais un produit comparable d'une marque concurrente pour laquelle les informations relatives aux pratiques environnementales sont plus favorables	Coefficient de corrélation	,635**	,810**	1,000	,202**	,371**	,208**
		Sig. (bilatéral)	,000	,000	.	,001	,000	,001
		N	267	267	267	267	267	267
	Qualité	Coefficient de corrélation	,172**	,205**	,202**	1,000	,367**	,418**
		Sig. (bilatéral)	,005	,001	,001	.	,000	,000
		N	267	267	267	267	267	267
	Eco-pratique	Coefficient de corrélation	,319**	,351**	,371**	,367**	1,000	,572**
		Sig. (bilatéral)	,000	,000	,000	,000	.	,000
		N	267	267	267	267	267	267
	Traçabilité	Coefficient de corrélation	,148*	,200**	,208**	,418**	,572**	1,000
		Sig. (bilatéral)	,015	,001	,001	,000	,000	.
		N	267	267	267	267	267	267

** La corrélation est significative au niveau 0.01 (bilatéral).

* La corrélation est significative au niveau 0.05 (bilatéral).

10. Level of transparency

10.1 Boxplots



10.2 Student test

	Mean	Min	Max	Standard deviation
I would use blockchain to get more information/transparency on the raw materials used (a)	3,99	1	5	0,964
I would use blockchain to get more information/transparency on the production process (b)	3,88	1	5	0,940
I would use blockchain to get more information/transparency on the country of origin ("made-in") of the product (c)	4,13	1	5	0,928

Test des échantillons appariés

		Différences appariées							
		Moyenne	Ecart type	Moyenne erreur standard	Intervalle de confiance de la différence à 95 %		t	ddl	Sig. (bilatéral)
					Inférieur	Supérieur			
Paire 1	J'utiliserai la blockchain afin d'avoir plus d'informations/de transparence au niveau des matières premières utilisées - J'utiliserai la blockchain afin d'avoir plus de transparence/d'informations au niveau du processus de production	,112	,645	,039	,035	,190	2,847	266	,005

Test des échantillons appariés

		Différences appariées							
		Moyenne	Ecart type	Moyenne erreur standard	Intervalle de confiance de la différence à 95 %		t	ddl	Sig. (bilatéral)
					Inférieur	Supérieur			
Paire 1	J'utiliserai la blockchain afin d'avoir plus de transparence/d'informations au niveau du processus de production - J'utiliserai la blockchain afin d'avoir plus transparence/d'information au niveau du pays d'origine (« made-in ») du produit	-,258	,754	,046	-,349	-,168	-5,601	266	,000

Test des échantillons appariés

		Différences appariées							
		Moyenne	Ecart type	Moyenne erreur standard	Intervalle de confiance de la différence à 95 %		t	ddl	Sig. (bilatéral)
					Inférieur	Supérieur			
Paire 1	J'utiliserai la blockchain afin d'avoir plus d'informations/de transparence au niveau des matières premières utilisées - J'utiliserai la blockchain afin d'avoir plus transparence/d'information au niveau du pays d'origine (« made-in ») du produit	-,146	,664	,041	-,226	-,066	-3,594	266	,000

