

Louvain School of Management

The Use of Blockchain to Fight Counterfeiting in the Second-Hand Luxury Fashion Market

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Academic year 2021-2022
Dissertation for the Master of Business Engineering
Master subject and focus: CEMS - Innovation
Daytime schedule

Acknowledgments

This master's thesis marks the end of our academic journey at UCLouvain and Louvain School of Management. We would therefore like to thank all those who contributed, directly or indirectly, to the completion of this work.

First, we express our sincerest gratitude to our supervisor Bernard Paque for his precious advice and for the time he dedicated to our thesis. We truly appreciated his enthusiasm for our topic and his guidance throughout the year.

We would also like to thank all the industry experts we were lucky enough to interview: Julia Chinakaeva, Graham Wetzberger, Daniela Ott, Alba Figueras De La Parte, Ataman Ersan, Angela Cearns, and the Anonymous Informant from LVMH. We are very grateful for their involvement in this project without which we would not have been able to deliver these results.

Furthermore, we are thankful for Rosalie's boyfriend Maxime Clément, who transferred his passion and knowledge on blockchain, having himself written his master's thesis on this technology one year ago.

A final thank you to all our friends and families for their unwavering support.

Executive summary

The luxury fashion industry's fight against counterfeiting has been going on for decades, with brands often spending their own resources to stop the distribution of fakes and reclaim deceived customers due to unsteady support from regulators globally. With the rise of the second-hand market and its online players, counterfeiters and owners of fakes have found new ways to make profit. In this research, blockchain is introduced as a potential solution to prove authenticity of luxury fashion goods and add trust to these marketplaces. A review of the existing literature and interviews are used to explore the views of the various stakeholders on the technology, its scalability and potential for standardisation. Four scenarios for the future of the market are constructed, resulting from the combination of two selected uncertainty variables. This thesis ends with recommendations for each scenario, conclusions, limitations, and next steps for further research.

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1. Introduction

1.1. Research context

Historically, luxury fashion brands handcrafted their products in small batches within their region of origin. The combination of the premium quality craftsmanship and the perceived rarity of the products justified their high price tags. Shoppers who'd like to own luxury items but are unable to afford them at full price or care for sustainability are turning to the increasingly popular second-hand luxury market, valued at 33 billion EUR for luxury in 2021 (Peer Ledger, n.d.; Statista, 2022).

A major risk associated with second-hand purchases is that the buyer cannot always be sure of the authenticity of the item. Most luxury brands do not offer a range of second-hand products. The resale market is mainly made up of third-party sellers who have no direct affiliation with luxury brands. Customers must rely on the integrity of these sellers and the validity of authenticity certificates passed on throughout the product's lifecycle. But counterfeit manufacturing has become very advanced and discerning a real luxury good from a replica has become a complex task, mastered only by a few thousand experts around the globe (Peer Ledger, n.d.).

Every year, counterfeiting costs brands billions of dollars. The production of fakes has massively increased with the decrease of manufacturing costs in Asian factories. Counterfeiters take advantage of the reduced control brands have over their supply chain – some even say luxury suppliers produce additional goods to sell them illegally on the grey market (Peer Ledger, n.d.).

Blockchain technology can be a solution to counterfeiting and empower brands with more control over second-hand sales of their products. By giving physical luxury products a digital identity, both the brand and the consumer can trace their lifecycle from raw materials production to their owners and prove their authenticity (Peer Ledger, n.d.).

1.2. Motivations

Blockchain is a trendy technology with potential applications in countless industries. Beyond the buzzword, a lot of people don't understand the inner workings of the technology, nor can they predict a future where blockchain is part of our everyday lives. Because of our common interest for the luxury industry, we looked at the different applications of blockchain for luxury brands and stakeholders and found a deeper interest in the second-hand market, which has grown in popularity over the past decades with rising sustainability concerns. Through this thesis, we want to investigate how the market will change in the near future, and how blockchain will contribute to that change beyond the hype.

1.3. Methodology

To investigate the topic, a review of the existing literature is carried out on its different components, starting out with the luxury market, then addressing the second-hand luxury market as well as the counterfeiting issue. Blockchain technology and its potential applications for the luxury industry are then introduced, focusing particularly on second-hand and authentication. To confirm or challenge the information from the literature, seven industry experts were interviewed, ranging from luxury brands, second-hand marketplaces, blockchain providers to researchers. With all this data, it is possible to highlight uncertainty variables that will impact the success and scalability of the technology in the luxury industry. Four non-exhaustive scenarios are presented to examine potential future states of the market, alongside recommendations for stakeholders.

2. Theoretical background

2.1. Luxury fashion market

2.1.1. Definition

What was once known as a quiet sector steered by product excellence and governed by a few families has now developed into a large, complex, and competitive industry (Ko et al., 2016; Okonkwo, 2009). The value proposition of the luxury industry originally included high-priced, high-quality products, prestigious stores, brand legacy, unique knowledge, exclusivity, personalisation of services and communications, intertwined with long-lasting relationships with selected customer base (Kapferer, 2014). Most of these characteristics are still relevant. Nowadays, most of the industry is controlled by large conglomerates: the top ten largest luxury companies account for over 50 percent of all incomes in the industry. These companies include LVMH, Richemont and Kering (see [Appendix 9.1](#)) (Deloitte, 2016; Deloitte, 2020; Kernstock et al., 2017).

The luxury industry has reached an extreme level of globalisation in the last decades – prestige goods have become popular among all sorts of buyers in new markets, making up what we refer to as new luxury (Belk, 1999; Kapferer & Laurent, 2016; Liu et al., 2016; Silverstein & Fiske, 2003). New luxury implies that luxury goods are no longer exclusive nor unique; their reach and accessibility has been democratised (Silverstein & Fiske, 2003). This has resulted in a phenomenon called “mass luxury” where customers are much more attached to brands, stretching themselves out to more affordable assortments, rather than being attached to products (Cristini et al., 2017). Luxury brands are perceived as having a prestigious image, built on attributes such as craftsmanship or service quality, which makes them worthy of demanding a superior price. They inspire a deep connection with the customer (Ko et al., 2019).

Luxury encompasses many different categories of products and services. In the context of this thesis, personal luxury goods, the second-largest segment of the industry after luxury cars, will be the topic of interest (Sabanoglu, 2022). Luxury fashion – apparel and accessories – will be looked at specifically.

In 2021, the global luxury fashion industry was valued at 108.4 billion USD, recovering from a pandemic-induced slump in 2020 – cancellations of fashion weeks and fall of travel-related shopping have particularly impacted sales (Shen, 2020; Statista, 2022). It is expected to reach 153.97 billion USD by 2026, growing at a 5.66 percent CAGR. The luxury fashion market is

gaining momentum because of the increase in number of high-net-worth individuals, the rising popularity among younger generations (Millennials and Gen Z) and increasing brand loyalty among the clientele. Technology is playing a role in the success of luxury as well: the penetration of online channels across developing markets and the adoption of innovative technologies provide new growth opportunities for luxury brands (Research and Markets, 2021).

2.1.2. Supply chain

Globalisation has extended and complexified the supply chains of luxury fashion goods (Kathiala, 2020). Numerous players are now involved, with large brands controlling small-scale, highly specialised suppliers (Brun & Moretto, 2014). For example, raw materials can originate from one country to then be processed in another – leather from South America can be tanned in Italy, for the products to then be assembled in Asia before they're globally distributed to the final customers. The key to success in the luxury industry is a good management of its complex logistics and supply chain (Brun et al., 2008). The uniqueness derived from luxury brands' reputation justifies the need for a careful control of the supply chain: manufacturers need to protect their exclusive competitive advantage with particular care from other parties in the network who might replicate it (Lamming et al., 2000).

2.1.2.1. Upstream supply chain: sourcing and manufacturing

High quality defines luxury. Therefore, according to Brun et al. (2008), sourcing must be rigorously handled to ensure every phase of the manufacturing process complies to the required quality level. This often entails sourcing from hyper-specialised suppliers in specific countries known for the quality of their materials, such as Italian leather or Indian cashmere. Brands create long-term partnerships with these suppliers to guarantee reliable quality and collaboration over time. Some steps of the supply chain need to be kept in-house, such as cutting, whereas more labour-intensive phases such as sewing tend to be outsourced, with a close monitoring from the brand.

Some luxury companies outsource all stages of manufacturing to neighbouring craftsmen or small companies, often part of the same industrial district, who then make up their production department. The governing company takes care of the planning and procurement activities and delegates the work to the different providers, who are often fully committed and therefore

cannot be left inactive. This tight relationship between brand and suppliers allows for a strict control over quality and avoids the creation of a grey market (i.e., suppliers manufacturing extra products to sell them through unauthorised channels) (Brun et al., 2008).

In the upstream part of the supply chain, information trade is less recurrent: production plans are made by the focal company and communicated to outsourcers and suppliers only through specific orders. This is because suppliers and outsourcers are mainly small craftsman companies, and the brand believes they are not qualified to look at the business from a wider point of view to deal with supply chain planning and management (Brun et al., 2008).

The growth of the industry has required a lot of brands to expand their operations to low-cost factories, often going against their claims of premium craftsmanship (Kapferer & Bastien, 2009). For instance, Burberry shut down its historical UK factory and relocated its production to China in 2007. In 2010, Prada delocalised from Italy to China. Coach and Polo Ralph Lauren are now manufactured in China as well (Kapferer, 2017). The reputation of brands is at stake, as luxury fashion is drifting away from its traditional standards of uniqueness and value chain control (Kapferer & Bastien, 2009).

As stated by Christopher et al. (2004), the fashion world in which luxury companies compete is driven by seasonal events. Each season is typically defined by three main phases. The first phase, collection design, ends with the presentation of the collection to the market. Then comes the production phase, dependent on customers' orders. Finally, there is a replenishment phase. This structure implies a fluctuating demand profile with an extremely short maturity period in the product lifecycle. The demand for a product is hard to predict, as it is subject to fashion trends.

Style and design excellence are accomplished by keeping the design activities in-house while collaborating with experienced external stylists and designers at the same time. Suppliers are also a precious asset for finding new innovating materials, technologies and solutions that improve the manufacturing processes and/or are valued by clients. Finally, the style and aesthetic requirements of a brand drive the design of mono-brand boutiques, hence building a connection from manufacturing to retailing (Brun et al., 2008).

2.1.2.2. Downstream supply chain: distribution

The downstream part of the luxury supply chain tends to be very short: luxury brands rather bypass any kind of wholesaler or distributor and sell directly to the final points of sale. Retailers can sometimes access a reserved section of the brand's website and put replenishment orders that will be registered online. The retailing system has been thought of to build a direct relationship between the customer and the company: creating a network of mono-brand controlled (owned or franchised) stores in addition to improving the service in terms of delivery lead times, product availability, direct communication with the brand company, replenishment programs, support to the salespeople and data sharing (Brun et al., 2008).

There are two ways for luxury brands to control distribution. The first approach consists in operating a direct network of retail locations, often designed by famous architects as concept stores; this is often limited by financial constraints and by the lack of space in the most attractive and esteemed areas of cities. The other approach involves opening non-directly operated, mono-brand points of sale (i.e., franchising stores) and training the boutique's personnel with respect to product features and customer relationships. Both approaches enable electronic ordering systems, the monitoring of sales and customer information that can be used for loyalty programs (Brun et al., 2008).

The relatively high volumes and the presence of longer lifecycle products allow luxury companies to adopt some supply chain practices that partly resemble mass-production, such as make-to-stock, production offshoring, or the use of MRP or ERP systems as adapted to the luxury context. The imperatives to protect unique resources and to ensure top quality create the need for tight control over the sourcing network and supplier selection criteria, while the enhancement of brand reputation necessitates control and ownership of the distribution channels (Caniato et al., 2011, p.630).

2.1.3. Second-hand luxury fashion market

2.1.3.1. Definition

The retail trade of second-hand items has a long history of development and tradition. It is believed that people in European countries began purchasing and selling worn garments in the 14th century due to poverty. The desire to own diverse items, all of which are different in character at any given time, as well as financial constraints, were the catalysts for the explosive development of second-hand products trade, which dates back to the days of barter and

continues to the present day. The second-hand retail market is regarded as a subset of the main commodity market, with each product adding value to its owner regardless of whether it is new or used (Hristova, 2019).

A luxury fashion product, that tends to be of high quality and made with repair and multiple wears in mind, particularly lends itself to resale (Cheng, 2022). To shed more light on the conceptual definitions of second-hand luxury, three interrelated terms are discussed: second-hand, vintage and collector's pieces. Second-hand goods refer to previously owned and used items whose financial value is lower compared to the original product. In that case, price and sustainable consumption are the main drivers for resale. Vintage items are previously owned, but not necessarily used items. They typically represent a specific style or era of a couturier, linked to the value of the product alongside their condition. Finally, collector's pieces tend to be acquired to own and possess rather than to use and wear – their owner attaches an intrinsic and psychological value to them (Turunen & Leipämaa-Leskinen, 2015). Generally speaking, there's value to resale of luxury, whether it be sentimental – think of a Burberry trench coat passed down from generation to generation – or qualitative – a rare and sought-after Oscar de la Renta design from the 1960s for example (Cheng, 2022).

In the context of this thesis, the term second-hand is used in the general sense of pre-owned luxury items.

2.1.3.2. Growth drivers

The Business of Fashion report about the Future of Resale (2021) estimates the second-hand fashion market to reach 57 billion USD in sales by 2025, meaning 25 billion USD more than today (Lee & Malik, 2021). ThredUp, an online second-hand marketplace, estimates that resale will grow 11 times faster over the next five years compared to the overall clothing retail sector. In the luxury segment, growth of resale will be four times faster than the primary market's growth (Beauloye, 2019). KD Market Insights offers a similarly positive estimate of growth, projecting the luxury second-hand goods market to reach 52.3 billion USD globally by the end of 2024, a 14.1 percent CAGR between 2019 and 2024 – 92 percent of the total fashion resale market is therefore made up of luxury items in terms of sales (Jill, 2020).

According to a BCG study, online marketplaces currently generate about 25 percent of sales in the global second-hand luxury goods market (Ducasse et al., 2019). While second-hand luxury

transactions are still largely happening offline, specialised digital players are driving much of the growth in the industry and are supposed to increase by 30 percent annually (Berg et al., 2021). A global study conducted by Bain & Company attributed this increase to customers' changing behaviours, as well as the continuous professionalisation of the Internet (Arpizio et al., 2015).

The second-hand market is mainly located in the European Union (50 to 55 percent), followed by the United States (25 to 30 percent), while 10 percent are in China. In a survey conducted by McKinsey, 41 percent of buyers state access to rare and exclusive products as what attracted them in the resale market. A similar number of consumers state sustainability as their main reason for shopping second-hand. 35 percent prioritise affordability, explaining that buying pre-owned goods saves them money. Nine out of ten customers that participate in the second-hand market are also new product buyers, and three-quarters sell their own items. The numbers show cyclical transactions – customers sell items as part of a pattern to free up space in their closet, change style, or to get rid of old items (Berg et al., 2021; Lee & Malik, 2021).

Overall, 75–80 percent of luxury consumers are still strictly new-product buyers. However, consumption patterns have been changing. Prices for new products can be considered exorbitant, and consumers are eager for a frequent refresh of their wardrobe, pointing many towards buying and selling pre-owned products. These behavioural changes have led to the success of the luxury resale market. Among enthusiasts, consumers look to “more affordable” luxury items (Amatulli et al., 2018; Kessous & Valette-Florence, 2019). These new consumption patterns have been accelerated by the pandemic, by digitisation, and by the so-called “generational headwind”: younger buyers, are more willing to purchase pre-owned products compared to older generations (Berg et al., 2021).

As awareness of environmental issues has increased, environmentally friendly consumption has become essential rather than optional. The limited resources within the industry and the negative impact of rapid consumption have indeed made the transition to a sustainable model of fashion an important need. Millennials and Generation Z in particular, who have recently emerged as major luxury consumers, tend to show environmentally friendly and ethical consumption behaviour. Due to their strong and growing purchasing power, the concepts of sustainability and circular economy have been discussed and applied in various industries such as fashion and luxury. This has been driving the growth of the second-hand market, that gives the opportunity to shop in an eco-friendlier manner (Kim et al., 2021).

Currently, luxury resale is mostly geared towards women's fashion. Around half of the luxury resale trade is made up of jewellery and watches, with handbags and shoes accounting for just over a third (Berg et al., 2021; Lee & Malik, 2021). These items are typically more expensive than clothing, representing more of an investment that gains value over time and therefore benefits the first-hand buyer when they decide to resell (Lee & Malik, 2021). According to a report by Jeffries, some handbags even outperform the most successful hedge fund, reaching returns of over 30 percent. A Hermès Himalaya Birkin, iconic handbag of the French luxury design house, was bought for 29,600 EUR in 2010 and sold for 157,500 EUR in 2016 on the second-hand market (Gonzalez-Rodriguez, 2018). Haute couture clothing items do not stand the test of time as much: their styles are often specific to a particular seasonal trend, and they can deteriorate through washing cycles. Therefore, clothing tends to depreciate more than accessories, explaining lower volumes of sales in the luxury second-hand market (Lee & Malik, 2021).

2.1.3.3. Authentication

Through second-hand, the experience of luxury can be transferred from one owner to another. Second-hand luxury shoppers, when acquiring a pre-owned item, appear to have more active and even empowered roles – they might develop closer relationships with the used product and give it a deeper meaning. The experience of luxury is therefore co-created with the consumers, the product, the brand, and the distribution channel (Turunen & Leipämaa-Leskinen, 2015).

During the resale process, authentication seems to be particularly important, as consumers believe they are taking risks when buying previously owned luxury goods (Turunen & Leipämaa-Leskinen, 2015). The importance of proving authenticity and tracking a product's history has increased with the growth of luxury resale businesses (Amed et al., 2021). Authenticators particularly look at the materials, stitching and hardware of items to tell the difference between fakes and genuine products (Corsearch, 2020). Graham Wetzberger, expert authenticator, even knows what fake tastes like: "Tiffany & Co counterfeits can be coated in aluminium. If you taste it, it's like a soda can, it has a metallic taste that sterling silver doesn't have" (Biondi, 2021).

Specialist e-retailers seeking to build a viable luxury second-hand marketplace offer authentication services to guarantee the origin of every product they sell. The authentication services currently available are moving in the right direction, but brands are far from being

convinced (Kapferer, 2018). The emergence of fake authentication services has brought a new issue (Biondi, 2021). Some Chinese sites copy the names, layouts, and imagery of established authentication services. The problem goes even deeper, with fraudulent companies offering fake courses for individuals who want to be trained as expert authenticators, one of the growing professions in China (The Fashion Law, 2019).

By providing their own authentication services, luxury brands could overcome this problem and challenge counterfeiting, which is one of the main issues of the second-hand market. This can also allow brands to welcome new customer groups, who might even turn into primary customers in the future (Turunen & Leipämaa-Leskinen, 2015).

2.1.3.4. Positioning of luxury brands

The growth of the resale market has created an additional marketplace that lies beyond the control of luxury brands. The luxury sector mostly ignores what happens to its products after they get sold to clients, other than ensuring their long-lasting quality. Only a few brands are involved in the resale of their products, especially since dedicated e-commerce marketplaces have made reselling easier and more substantial (Kapferer, 2018).

Luxury brands have been reluctant to engage in second-hand activities for cultural reasons. Historically, they worked to offer unique products for a specific target customer, taking the names of their creators – craftspeople, artisans, and artists. This way, luxury promises novelty, even when producing great classics. Second-hand items can be considered less attractive because they cannot present this original uniqueness. For some customers, a used product will always appear to be “spoiled” by the person who previously owned it. This sense of intimacy might not be an issue if the previous owner was a celebrity, but celebrities selling their luxury wardrobe items is rare, with the exception of some auction sales (Kapferer, 2018).

Another argument is the legitimising factor of exclusivity, signalling that luxury brands are choosing their preferred customers and not the other way around. The high price of a Dior bag is discriminatory, just like the annual entry fee to some golf clubs for example. The goal is to keep the doors closed for most applicants. Entering the resale market is a move in the opposite direction, looking for new customers with less purchasing power, instead of focusing on very important customers – the lucky few who contribute to the brand's profits, as long as they feel that the brand belongs to them and gives them the feeling that they are special (Kapferer, 2018).

A third relevant factor is the risk of cannibalisation. Even though shareholders are demanding new sources of revenues and high profitability, selling pre-owned products may cause the brand to cannibalise sales of new products and collections, which might explain why luxury brands have left the second-hand market to third parties (Kapferer, 2018).

Nevertheless, the views of professionals on the “sharing” of these two markets are mixed. Joëlle de Montgolfier, director of research at the European Centre of Bain & Company, points out: “Although the luxury consignment market affects the sales of new products, it provides luxury products with an image of durable goods with better defined resale values, which in the end contributes to increasing their overall value” (Kessous & Valette-Florence, 2019). Indeed, luxury goods bought through second-hand marketplaces act to promote the luxury brand in question even though they do not have a direct effect on their sales. In addition, second-hand purchases allow luxury brands to introduce their products to new consumers, who may not buy luxury goods in the first place. The second-hand market is therefore a useful way for luxury brands to connect with and anchor their brand in the minds of buyers who may become primary customers in the future. When the purchasing power of second-hand buyers increases, giving them the financial resources needed to buy first-hand, they are already educated about the brand and may remain loyal after the transition (Ducasse et al., 2019).

Regarding second-hand sellers, they resell their luxury items to regain some of the money initially spent and potentially reinvest it in new, full-price luxury products. Oscar de la Renta, that launched its in-house second-hand marketplace “Encore”, has confirmed the latter: 75 percent of Encore sellers choose to get paid in store credit (Cheng, 2022). This benefits luxury players, increasing customer retention and primary-market sales (Cheng, 2022; Ducasse et al., 2019).

Other arguments for entering the second-hand market are indications of how luxury brands could compete with existing third-party players. First, brands hold a competitive advantage. In luxury, as in art or any other unregulated market, trust is fundamental. When a pre-owned product offers intact quality and is sold by its original brand, it evokes strong trust, as well as an opportunity to experience exceptional luxury service and become part of the brand's community. Trust therefore presents a clear opportunity for luxury brands: they can overcome the consumption risks inherent to any uncontrolled grey market (Kapferer, 2018).

In addition, luxury brands need to attract younger generations. If these young consumers are different from older ones, brands must fit to their expectations, notably by applying circular economy, sustainable and ethical practices (Kapferer, 2018).

Finally, expanding the customer base and earning additional revenue is a way to fit the financial equation of the luxury business model (Kapferer, 2018). Emily Gittins, founder of Oscar de la Renta's Encore, says:

It will shift business models, because there's now this opportunity to generate revenue from the second, third, fourth purchase of a garment, which means that brands can invest in high-quality products that stand the test of time — that's worth it for them because they see those dividends down the line (Cheng, 2022).

This argument, though, must be balanced with a strategic question: do brands need these new customers, or should they devote all their efforts to their primary customers and make sure they continue to feel special and engage with the brands? This challenge means a return to the problems luxury brands have faced in the past, when the democratisation of luxury was the dominant trend (Kapferer, 2018).

To sum up, if luxury brands decide to participate in the luxury resale market, it would allow them to expand their offerings, appeal to committed client segments and reinforce their sustainability efforts. However, even if motivated by second-hand consumers, they could only play a larger role in the second-hand market if they can find ways to add meaningful value to loyal customers' experience (Berg et al., 2021).

2.1.3.5. Second-hand luxury fashion market actors

2.1.3.5.1. Digital resale marketplaces

Digital has been the driving force behind the acceleration of the second-hand market. The COVID-19 pandemic led customers and brands to believe digital resale was a much more scalable option than physical resale stores (Cheng, 2022).

Digital resale marketplaces include C2C (Consumer-to-Consumer) models that connect consumers without intermediaries. These peer-to-peer services, such as Vinted, allow individual sellers to maximise the cash value of their sales by earning margins of up to 80-90 percent, depending on the marketplace. However, in many cases, sellers are also responsible

for listing, shipping, insurance, photography, and proof of authenticity for the products they sell, requiring a high level of commitment and participation (Simões Rodrigues, 2019).

This level of engagement is not expected for some players such as The RealReal, where there is an intermediary. BCG has indeed noted that these digital marketplaces offer “consignment, home pick-up, photography and storage” as key elements of their business model, creating insurance in a market where counterfeiting is a major problem. The individual resellers therefore do not benefit from a margin as high as on C2C websites, as the middleman takes a share of the price (Jill, 2020).

The RealReal is considered as the largest online marketplace for authenticated, consigned luxury goods. Over 22 million items have been authenticated and sold on the website since its launch in 2011. Focusing extensively on product authenticity, the company has 150+ expert authenticators, gemmologists, and horologists. The company's message focuses on the benefits of end-to-end services, brand authenticity, product diversity and sustainability associated with their business model: being a revolutionising luxury resale service aggregating and curating unique, pre-owned luxury supply that is exclusive to The RealReal across multiple categories for buyers around the world (Jill, 2020).

The RealReal engages sellers through a multi-step process. The first step is to select products to consign (with specific in-demand designer brands). Then, a virtual appointment is set up to discuss the items to be sold with a luxury manager or category expert. After this meeting, they receive the pricing based on expert input, and ship the items directly to The RealReal. The products are then photographed, priced, and sold on the website. The company offers sellers a commission-based payment structure with incentives based on the number of items sold, and claims the process is simple and fast, with competitive pay (Jill, 2020; Webb, 2022). The RealReal was the first publicly available luxury reseller, raising 350 million USD since its IPO in 2019 (Jill, 2020).

Vestiaire Collective, another main player in the digital luxury resale market, operates a bit differently in a process that resembles the C2C model. The seller is responsible for photographing the product and, once uploaded on the website, a team of over 30 people check the photos and decide if it is likely to sell on Vestiaire Collective. It is certified that every item sold will undergo a quality-authenticity control. Although the selling process is not dealt internally, Vestiaire Collective can identify the clients behind each order, which allows them

to stop scammers and reduce disputes between members. They adjust their risk management through a fraud assessment module that can be set up on an individual basis for each country (Adyen, 2018).

Other key players identified by the Business of Fashion report include Poshmark, StockX, GOAT, Farfetch, Rebag, ThredUp, Rebelle, Trove and Tradesy. The RealReal, Vestiaire Collective and the latter have a collective market share of 25-30 percent (Lee & Malik, 2021).

These digital marketplaces, benefitting from an increasingly committed consumer base, have been brought to the attention of some major luxury players, eager to collaborate (see [Appendix 9.2](#)). For instance, Gucci has partnered with The RealReal to recycle and upcycle garments. Richemont has acquired UK-based watch reseller Watchfinder, thereby taking over a new distribution channel and becoming a rival brand retailer. Last but not least, Kering has taken a 5 percent stake in Vestiaire Collective to improve its customer experience and its sustainability efforts (Berg et al., 2021). Alexander McQueen, British luxury fashion house owned by Kering, has partnered with Vestiaire Collective to launch the “Brand Approved” program, allowing shoppers to consign their pre-worn pieces from the brand in exchange for store credit (Cheng, 2022).

Currently, most customers are unaware of luxury resale partnerships. As discussed before, a brand’s ability to support and engage with the second-hand market reinforces a desirable aura of craftsmanship, durability, and sustainability, which could lead to an increase of its own products’ value. Luxury brands would also be able to have more control over their products, resulting in less counterfeiting (Berg et al., 2021).

2.1.3.5.2. Social media

Pre-owned items can also be sold through social media, involving no other intermediary. The leader in that field is Facebook Marketplace, which is integrated into the Facebook app and website. Unlike other second-hand actors, it is based on messaging other users – customers can directly message sellers in their area about items they’ve listed on the app and arrange payment and shipping, without paying extra fees to Facebook (Ghosh, 2018).

2.1.3.5.3. Consignment shops

The consignment service is the most famous model in the pre-owned luxury goods market. It can either be a physical, brick-and-mortar store, or an online consignment store. In a physical store setting, luxury resellers take care of finding the items, authenticating them, and placing them in their store, offering the advantage of tangibility. Online consignment shops take on the listing, shipping, photography and final return of second-hand items and guarantee authenticity. Both physical and online consignment stores typically only receive commission fees when an item is sold but may offer cash in advance to the owner for the most demanded brands and items. For sellers, they spend less time investing and have a lower level of participation, requiring little research and effort on their part. Nonetheless, sellers' margins range from 75 to 55 percent, which is much lower than for C2C business models. In addition, the duration of the process of commercialising and selling the item might be extensive and prices might be volatile (Simões Rodrigues, 2019).

2.1.3.5.4. Auction

Auction houses are the traditional model used to sell pre-owned luxury items, mainly for art and watches, where sellers would sell items for the higher auction offered and then pay a commission to the auction house. But lately, some of the most famous auction houses are targeting the opportunity to enter second-hand luxury fashion market through their websites, launching a weekly live auction calendar dedicated to handbags and accessories, as a strategic tool to engage and reach collectors through lower-level items. Moreover, auction houses generally have better access to art collectors who own jewellery, watches, and fashion items – allowing them to sell a higher number of second-hand luxury items. Regarding the seller, they take a risk as they don't know the final price ahead of the sale, in addition to the commission fee that needs to be paid to the auction house, regardless of the price. Nevertheless, auction houses remain attractive to sellers, considering products from prestigious brands such as Hermès, Chanel and Louis Vuitton can be worth more on the secondary luxury market, giving them the chance to make a profit (Abnett, 2015).

2.1.4. Counterfeit luxury fashion market

2.1.4.1. Definition

The World Trade Organisation's agreement on Trade-Related Aspects of Intellectual Property Rights defines counterfeits as “any goods bearing an unauthorised trademark and thereby infringing the rights of the trademark owner under the law of the country of importation”. Purpura (2013) defines counterfeiting as “the unlawful duplication of something valuable in order to deceive”, while Lai and Zaichkowsky (1999) describe counterfeits as “illegally made products that resemble the genuine goods but are typically of lower quality in terms of performance, reliability or durability”. These products are often made to take advantage of the higher value of the authentic version (Brandão & Gadekar, 2019).

Trade in counterfeit goods is now estimated to be worth more than 5 percent of total world trade (Brandão & Gadekar, 2019). Over 60 percent of the 500 billion USD generated yearly from counterfeiting comes from fashion and luxury goods, ahead of pharmaceuticals and entertainment products (Amed et al., 2021).

Cheaply produced luxury fakes are sold all over the world for a quick profit, with limited consequences in case of seizure (Seufer & Ciecieląg, 2020). Most luxury fakes seized by law enforcement agencies are watches, leather goods and sunglasses (OECD & EUIPO, 2019). Some of the most counterfeited luxury brands are Chanel, Louis Vuitton, Prada, Fendi, Gucci and Dior (Research and Markets, 2017).

The manufacturing and selling of counterfeited products are prohibited by law and can result in civil and/or criminal penalties. Generally, brand owners can sue counterfeiters for damages and obtain an injunction (or court order) to stop them from operating. Additionally, in some countries, the government can impose fines and even jail time on individuals or manufacturers convicted of selling counterfeit goods (International Trademark Association, 2020). In addition, buyers of counterfeited items can be punished by the confiscation and destruction of the seized goods. The handling and destruction costs are usually borne by the trademark holder but may be passed on to the seller or even the buyer, depending on national legislation. They could also require a claim for damages (whether or not through legal action), except if the buyer is able to demonstrate that they purchased in good faith (for example, the website indicated no trademark, or the price was credible). In Belgium, consumers do not risk any legal sanction. In

other European countries, a punishment may apply (European Consumer Centre Belgium, 2022; Federal Public Service Finance, 2019).

A lack of clear, controlled, and consistent global regulation explains why illicit distributors have learned to go around the system by carefully selecting the location of their factories, warehouses, shipment service provider, banks, and online marketplaces (Seufer & Ciecieląg, 2020).

2.1.4.2. Deceptive and non-deceptive markets

A distinction can be made between deceptive and non-deceptive markets for counterfeit products.

In deceptive markets, consumers are imperfectly informed or not familiarised with the good, making them unable to distinguish between genuine and fake and leading to the purchase of a fake “by accident”. Deception is in that case achieved by a form of information manipulation aiming to influence customer behaviour by misrepresenting a product. The deceiver can use the strategy of concealment, where they hide relevant information, or give false information to manipulate the client (Brandão & Gaddekar, 2019). The deceptive market has gained momentum due to an increase in the quality of fake goods, making customers more confused about the authenticity of the products (Wiedmann & Hennigs, 2013). These high-quality replicas, often called “super fakes”, can be sold for thousands of dollars – their manufacturing has been made possible by more affordable and accessible equipment (Williams, 2018).

In non-deceptive markets, individuals can easily differentiate fake from authentic. We talk about cannibalisation when a customer would have purchased a genuine branded luxury good but deliberately opted for a counterfeit instead. In that case, buyers are accomplices rather than victims (Brandão & Gaddekar, 2019).

Another type of “fake” is rumoured to exist in China – luxury goods that are produced in the brand’s factory, but somehow slipped away to be sold for cheaper clandestinely on the black market. These goods are known as yuandan (原單) goods. However, a Chinese report from Sina found out that most of these goods are presented as authentic, made from leftover material, or having failed to pass inspection due to minor discrepancies, when they’re in fact completely

fake. Sina however cites an anonymous industry source who says these “genuine fakes” do not exist at all. The luxury goods industry is indeed very strict and secure within their supply chain, and subcontractors wouldn’t want to risk losing their partnership for the small benefit of selling yuandan goods (Flora, 2014).

In general, high-tier replicas are too expensive to produce to compete with the cheap copies. Moreover, they’re faced with a higher risk of being seized by customs (Seufer & Ciecielağ, 2020).

While having a container full of fake Ray-Ban glasses seized and destroyed will not hurt their manufacturer, this is not the case for a high-end replica which requires premium materials and sophisticated machinery to produce. It is legally – but more importantly, economically – safer for such manufacturers to sell their products under their own factory brand or even under a white label rather than as high-end replicas (Seufer & Ciecielağ, 2020).

2.1.4.3. Online sales of counterfeits

About 40 percent of luxury counterfeits’ sales take place online, as modern counterfeiters take advantage of the ubiquity and anonymity of the Internet to go unnoticed and manipulate information. Long gone is the era where the leading distribution channel for fakes was a blanket laid on a pavement in a tourist destination – today’s manufacturers of fakes have a direct and constant access to countless consumers rather than just a few tourists (Fontana et al., 2019; Seufer & Ciecielağ, 2020). The Internet also allows counterfeiters to sell fakes without prior inspection from the customer – if the product is presented online in an elaborate way, it can positively influence the customer’s perception of the product’s authenticity, leading to an increase in willingness to purchase (Brandão & Gaddekar, 2019).

With the rise of the second-hand market, fakes have been given an environment to proliferate in. The RealReal has previously been under scrutiny for failing to spot fakes – second-hand shoppers may think they are buying used luxury goods, when they’re in fact buying counterfeits (Kestenbaum, 2021). For customers that intentionally buy fakes, the Internet works to their advantage, making it easier for them to analyse the information and compare fakes with the authentic version (Brandão & Gaddekar, 2019). Overall, the increase in information asymmetry poses additional risk for luxury brands that could get the blame if consumers think the brands are the ones selling faulty products (Seufer & Ciecielağ, 2020).

However, the World Wide Web might not remain such a convenient distribution channel for deceptive fake branded luxury products, as luxury firms are accumulating legal challenges against eBay, Google, and other websites. This started in 2006 when LVMH won a legal challenge against Google. The Paris Court of Appeals ordered the tech company to pay LVMH 300,000 EUR for “misleading advertising, unfair competition and trademark infringement”. Then in 2008, a Paris court requested eBay to pay LVMH 35.5 million EUR in damages for its sales of counterfeit luxury items (Wiedmann & Hennigs, 2013). Nonetheless, despite these efforts, whenever an e-commerce marketplace eliminates fakes, another one tends to emerge (Fontana et al., 2019).

Social media networks have also become an important marketplace for sellers of counterfeit goods. As Meta has started offering e-commerce services, including Facebook Marketplace, they’ve emerged as hotspots for sellers of fake luxury goods. Private messaging apps such as Messenger, WhatsApp and WeChat have also been used as tools to reach consumers directly. Social media sites provide counterfeiters with the opportunity to hide by sending private messages and using disappearing content such as Instagram Stories (Reuters, 2022). Sellers use terms such as “1:1”, “AAA” or “designer quality” to indicate that they’re allegedly selling super fakes on non-deceptive markets (Luna, 2020). Research by analytics firm Ghost Data identified over 26,000 counterfeiters operating on Facebook, and over 20,000 accounts dedicated to fake luxury goods on Instagram. 65 percent of these accounts are based in China (Reuters, 2022).

Reddit has also been hosting a community of millennial women hooked on counterfeit luxury goods. Founded in 2016, the sub-Reddit “RepLadies” counts over 200,000 members who are sharing knowledge about the best manufacturers of fakes and how to buy from them. High-quality replicas of everything from Rimowa suitcases to designer shoes are subject of discussions, but handbags are the real attraction. They’re sold for about 10 percent of the price of the authentic version, for a quality that very much resembles the original. Members are often wealthy businesswomen who work hard for their money and don’t want to spend it on a 75,000 USD necklace. Fashion houses are aware of this community, but counterfeit sellers are often based in China, where brands have limited power to act (Singh-Kurtz, 2022).

Most marketplaces and social media channels provide an abuse reporting system for brand owners to get the replicas of their products removed. AliExpress, Amazon and eBay have taken a proactive stance through the setup of monitoring systems supposedly preventing fakes from

being listed on their websites. However, the burden of protecting luxury brands cannot be entirely shifted to these third-party marketplaces, as such systems are not foolproof – brand owners often establish monitoring measures themselves (Seufer & Cieciela, 2020).

2.1.4.4. Drivers

Two main forces are driving counterfeiting. First, the high margins derived from the cheap manufacturing process. Second, the demand for lower-priced name-brand goods. The increasing attraction for luxury goods in the last decades has indeed been stimulating the demand for counterfeit versions as well (Brandão & Gaddekar, 2019).

Other factors are driving the sales of counterfeits, such as advances in technology and increased international trade, namely in emerging markets (Maaz & Ali, 2020). The World Customs Organisation (2012) states that the market has benefitted from the exponential growth of China and the increase of their exports. Two thirds of the total counterfeit shipments caught by authorities depart from China (UNODC, 2010). According to a 2020 report on intellectual property rights (IPR) seizures by the U.S. Customs and Border Protection, all seized counterfeits originating from China and Hong Kong would be worth about 1.1 billion USD if the goods had been authentic.

When buying a counterfeited luxury item, the consumer aspires to attain the same social status that they would have with luxury, for their own self-esteem and for others to see, as there is a certain level of prestige associated with owning a luxury product (Amaldoss & Jain, 2005; Belk, 1988; Godey & Lai, 2011; Mavlanova & Benbunan-Fich, 2010).

Some buyers of counterfeit luxury goods trust that they are receiving comparable goods at lower prices and don't see anything wrong with their action – they perceive designer prices as unjustifiable, thinking they can get sufficient quality for the price they're paying (Poddar et al., 2012; Tom et al., 1998). The prestige associated to a brand is important to luxury customers; individuals buying counterfeits value the same thing but try to benefit of the prestige at a cheap price (Delener, 2000).

According to a study by Shoham et al. (2008), “the consumer values ethical standards, and when they feel that a company is not living up to those standards, they will sacrifice themselves to punish the company, which could translate into going out and acquiring counterfeits”. The

opposite can also happen; customers may sacrifice themselves to defend a company with high moral standards. If the price of the counterfeit good is much lower than the price of its authentic counterpart, the quality is satisfactory, and the customer doesn't feel the need to support the luxury brand, then it is more likely that the customer will buy the fake, as price remains one of the most crucial indicators of a product's value (Brandão & Gaddekar, 2019). Lysonski & Durvasula (2008) stated that some customers do not recognise that buying fake products is harmful to a particular industry or that it can lead to a social cost, but only acknowledge the social benefits of counterfeit goods.

This "boycotting" of luxury products can be linked to the various claims of greenwashing associated with luxury firms. Margolis and Walsh (2003) indeed suggested that a lot of them are supposedly using sustainable practices as a mere way to boost their margins. Brands claim to be sustainable in response to growing pressure from NGOs, media, and consumers (Achabou & Dekhili, 2013). These claims tend to be symbolic rather than substantial. Moreover, sustainable practices do not always boost shareholder value, as some eco-friendly attributes such as recycled materials can go against the luxury philosophy (Kapferer, 2010). According to Kapferer & Michaut (2013) and Biswas et al. (2018), luxury customers don't see sustainability as a priority for brands to take on. Luxury purchases are indeed more irregular than 'classic' purchases, namely because of the price. Their impact on sustainability is therefore less resonant for consumers compared to fast fashion (Kapferer, 2017).

Luxury companies' failure to repress the growth of counterfeiting might also lie in the hollowing out of their brands. Many brands have indeed turned into tokens of status and privilege but not much else – they signal rather than deliver luxury by putting the emphasis on intangible over tangible product attributes and placing the logo over all other markers of quality. This outlook has been steadily applied to supply chains, manufacturing, and pricing: by moving production to low-cost countries, luxury firms detached the centuries-old union of luxury products with their historical places of origin. Outsourcing also led to loosened-up control over the supply chain, design, and manufacturing, just as counterfeiters were putting unparalleled pressure on these same processes. As a result, luxury brands have triggered a disconnection from their physical products, reducing customers' concerns about buying replicas of their products (Fontana et al., 2019).

2.1.4.5. Consequences

The 2018 Global Brand Counterfeiting Report estimated that counterfeiting was responsible for 98 billion USD losses in 2017, with online sales of counterfeits making up 30.3 billion USD of that amount (Driver, 2018). However, it is hard to measure actual losses. Indeed, the chance is high that buyers of counterfeits would never purchase authentic products in the first place. This doesn't mean that counterfeiting isn't harmful to luxury brands, but that its effects are rather insidious. The success of luxury is driven by originality and scarcity. When a luxury good becomes ordinary, it stops selling, and all the investment in R&D, design and marketing goes to waste (Seufer & Cieciela, 2020). And as the quality of counterfeits improves, it becomes harder to distinguish them from originals, aggravating the impact on luxury brands (Wiedmann & Hennigs, 2013).

Moreover, owning luxury goods comes with a sense of exclusivity that can fade when these goods are counterfeited (Brandão & Gaddekar, 2019). It decreases the perception of scarcity associated with the brand's products.

The effects of counterfeiting manifest themselves in multiple ways for brands: a loss of sales revenue and profit margin, overproduction, fraudulent product warranty claims, product liability claims, brand, and product reputation damage (Maaz & Ali, 2020).

Counterfeiting can escalate to fatal consequences for the brand, as modelled by Maaz & Ali (2020) over these four stages (see [Appendix 9.3](#)):

- a) Entry: counterfeiters enter the market, producing fake goods at a small scale. The limited volume of replicas produced usually goes undetected and allows counterfeiters to reach an entry point from which they can scale up.
- b) Growth: at this stage the fake good is being produced at a larger scale. It becomes more cost-effective for counterfeiters to further expand their production. The volume of sales of the authentic product slows down as the replica substitution starts achieving scale and traction.
- c) Critical: the volume of fake products begins to significantly force the authentic product out, resulting in a slump in profit and market share. By this stage, counterfeiters have stolen a considerable part of the authentic product's market share. Furthermore, customers are

now aware of the existence of counterfeit versions and may stop purchasing the product, further affecting the decreasing sales volume.

- d) Fatal: the counterfeiting issue can become so large and rooted that the genuine version is losing serious sales and profit, such that it becomes unprofitable. Customers no longer trust the product or brand, whose reputation has been damaged.

From an ethical and ecological point of view, counterfeiting has massive consequences. Fake goods tend to be produced under unregulated conditions, using hazardous and polluting materials and machinery. Adding to that is the impact of the incineration of the fake products seized by law enforcement. The carbon footprint behind the counterfeiting industry is therefore gigantic. Moreover, research conducted by World Trademark Review revealed a strong relationship between counterfeiting and criminal activities. Counterfeits are often produced in developing countries where a lack of regulation can lead to child labour and exploitation (Hai, 2021). Counterfeit investigator Alastair Gray said the proceeds from the sales of counterfeit goods might fund terrorism and organised crime as well. Whereas selling drugs would lead to a profit margin of 100-200 percent, selling fake goods online can give a profit margin of 2000 percent with less risk (ICAEW Insights, 2022).

At the same time, the prevalence of counterfeits can increase awareness of a brand, confirming that it is legitimate and prestigious. Bian & Veloutsou (2017) note that counterfeiting “is a sign of success for the counterfeited brand. Only well-established brands that are well recognised, liked, and respected will be counterfeited”.

2.1.4.6. Solutions

Luxury companies have different options to fight counterfeiting.

First, brands can better monitor counterfeiters’ activities, online and offline. They can make it difficult for counterfeiters to catch up by conducting market surveys or through routine alteration of design and packaging (Maaz & Ali, 2020).

Brands can also raise consumer awareness about how they should look out for fakes, and why the authentic product is better than a replica. On their end, shoppers need to carefully read refund or return policies, online reviews, and do their research about the brand they’re buying from (Maaz & Ali, 2020).

Reshoring is another ambitious option for brands who moved their manufacturing to cheaper factories. By returning their production back to their home countries, where stricter controls are easier to apply, luxury companies can have a tighter control over supply and distribution issues that have simplified counterfeiters' job. For instance, brands can prevent factory overruns that may be leading to the production of yuandan goods, distributed on alternative channels directly to consumers (Fontana et al., 2019).

In addition, luxury firms can make fakes less attractive to buyers by emphasising a style and quality that is hard to replicate for counterfeiters. That includes going beyond the brand logo as the only display of luxury and rather maintaining the traditional craftsmanship, handmade parts and legacy techniques that traditionally reflect the authenticity of luxury brands (Fontana et al., 2019).

Moreover, luxury firms' assumptions about their customers need to be adapted to the ethics and tastes of Millennials, who are becoming a major part of their clientele. Experience, sustainability, and sharing are now key focus areas for customers, rather than products, consumption, and exclusivity. Post-sale services such as maintenance, repair, or alterations, as well as the booming trend of pre-owned luxury goods, are promising areas for luxury firms to explore and invest in. Such a strategic move could allow luxury brands to take control over their products throughout their lifecycle. Consumers would also be able to purchase more affordable options directly from brands, rather than having to go for cheaper replicas (Fontana et al., 2019).

Finally, luxury brands can leverage technology to fight counterfeiting. These technologies can be classified into four different groups: holograms and filigrees (manifest technologies); safety inks and invisible printing (hidden technologies); chemical tags & bar codes, NFC and RFID ('track-and-trace' technologies) (Bansal et al., 2013; Choi et al., 2015; Li, 2013). The options substantially vary in the degree of sophistication and cost. Luxury brands would only consider cost-effective, resistant, and durable technologies that are compatible with luxury products and their complex distribution chain (Bansal et al., 2013; Choi et al., 2015; Li, 2013).

RFID (Radio Frequency Identification) technology, as its name suggests, uses radio frequency to identify, detect and locate objects (Varese et al., 2008). A specific label, called the RFID tag, is activated by a special reader that allows the remote reading of the information displayed by the tag. An RFID tag contains information that can be remotely read through a special

reader. Through magnetic impulses, the data contained in the tag can be codified (D'Ascenzo, 2005). Passive RFID tags don't have their own power supply and must be activated using the reader's antenna. RFID tags can be used in the textile industry in two ways: (1) The tag allows for the tracking of a product in several stages and locations of the production process. This can be applied for automated inventory management, quality control, access control, payment systems and general security applications. (2) One can verify the authenticity of a product by reading the specific product and reference information on the RFID tag, therefore helping the fight against counterfeiting. When a product passes an RFID reader, its authenticity is automatically checked by reading the information on the tag. A protocol is run, declaring the product to be genuine if the pre-determined necessary information is present on the tag (Tuyls & Batina, 2006).

NFC (near-field communication) technology derives from RFID. It is more secure because of its very short range (10 cm). NFC tags can communicate important data about a product to operators with near-field transmissions. They can therefore be used for traceability and inventory purposes. Outside of supply chain, NFC tags have many applications, the most popular one being contactless payments. Within the supply chain, NFC tags can be placed inside the packaging of individual products. Placing them in hidden locations is more secure, preventing tampering and manipulation of the label. Tags irreversibly stop communicating as soon as they detect tampering at the hardware level (Batina et al., 2007).

In the following sections, the term RFID is used to define both RFID and NFC technologies, as one derives from the other.

RFID technology's security relies on the fact that RFID tags are harder to copy than bar codes. However, counterfeiters are quick to catch-up with technology, and it will only be a matter of time until they can clone RFID tags as well. By capturing the necessary information for authentication (for example by eavesdropping the protocol between the tag and the reader) and storing it into a new chip, counterfeiters can effectively clone the original tag. The reader wouldn't be able to distinguish between the original and the copy if the information is the same. To prevent this, RFID-tags can be made unclonable through physical countermeasures, such as Physical Unclonable Functions. Retrieving the secret information by actively or passively attacking the protocols can also be made impossible: cryptographic techniques such as digital signatures and secure identification protocols can be used to this end (Batina et al., 2007).

The China Certification and Inspection Group has been making strides in the fight against counterfeiting with the product passport technology, a “one item one code” system allowing shoppers to scan a code leading them to the confirmation of a product’s authenticity. Luxury brands are jumping on the trend as well. Chanel is launching a digital passport that will be accessible through a scannable metal plate inside its products, replacing the tangible authenticity card certificates. Such a digital passport will enable the brand and its clients to immediately identify authentic products and ensure that after-sales services are only accessible to genuine luxury goods owners (Amed et al., 2021).

Combining RFID tags with blockchain technology leads to a step further in the fight against counterfeiting. The digital certificate of authenticity embedded in the tag, an upgrade compared to the traditional paper certificate, can indeed be secured through blockchain, making it impossible for forgers to sell replicas (Authena, 2021). To understand how this would work, the blockchain technology is explained in detail in the following section.

2.2. Blockchain

2.2.1. Definition

Blockchain can be defined as a low-cost, decentralised and fully secure digital storage and transmission technology (Plisson, 2017). It is a peer-to-peer distributed asset database allowing a structured, chronological, immutable, and tamper-proof record of transactions being shared across multiple sites, geographies, or institutions (Venkatesh et al., 2020; Wang et al., 2019).

The decentralised and distributed aspects of blockchain mean that no unified authority exists among users. Instead, blockchain uses a peer-to-peer network of computer servers handled by decentralised owners (Helo & Hao, 2019). In other words, blockchain is an open and distributed online database ledger that is sequentially and chronologically generated, recorded, and verified by a network of computer servers. These blocks are distributed among several nodes of the infrastructure. Each block contains information about all the transactions within the system over a period of time. The information includes the creation timestamp, the hash of the previous block, and the transaction details (Esposito et al., 2018; Tian, 2016).

At its most basic, blockchain is an open-source code: “Anyone can download it for free, run it, and use it to develop new tools for managing transactions online. As such, it holds the potential for unleashing countless new applications and as yet unrealised capabilities that have the potential to transform many things” (A. Tapscott & D. Tapscott, 2016).

2.2.2. Characteristics

One of the main characteristics of blockchain technology is the consensus protocol. In order to have a decentralised technology, a common agreement needs to be reached by every computer on the network regarding the state of the ledger. This allows for the reliable authentication and verification of any transaction. The consensus proves that every node in the network shares the same exact data and therefore prevents manipulation of the data (Azzi et al., 2019).

In addition, a key feature of blockchain technology is immutability, meaning that it cannot be changed or altered and ensuring the permanence of the network. Indeed, every node on the system holds a copy of the digital ledger. Once the transaction blocks get added on the ledger, no one can go back to modify it. Thus, no user on the network is capable of editing, deleting, or updating any transaction (Iredale, 2021).

Another characteristic is the cryptographic technique that is used in order to ensure integrity, authenticity, immutability, and non-repudiation. Cryptography is a method of developing techniques and protocols to prevent a third party from accessing and gaining knowledge of the data contained in private messages during a communication process. The three main different ways in which cryptographic algorithms can be performed are: symmetric-key cryptography, asymmetric key cryptography, and hash functions (Sahu, 2021).

- a) Symmetric-Key Cryptography (Secret-Key Cryptography): this encryption method only needs a single key into application for both the encryption and the decryption process. This method might induce security issues when transferring the key between the sender and the receiver.
- b) Asymmetric-Key Cryptography (Public-Key Cryptography): this type of encryption uses a pair of keys, an encryption key (public key), and a decryption key (private key), that are both generated using the same algorithm.
- c) Hash Functions: this encryption method doesn't make use of keys. A hash value of a specific length is generated from plaintext data of any size using a cipher. It is nearly impossible to recover the contents of the original plaintext data from the ciphertext.

Blockchains use the last two types of cryptographic algorithms: asymmetric-key algorithms, and hash functions (Sahu, 2021).

Blockchain technology can either be permissionless, permissioned or hybrid. A blockchain is permissionless (public) when anyone can participate in the process of verification without authorisation. No permission is required to consult the blockchain, to make transactions, to validate or mine blocks. Computer resource utilisation is often rewarded in this use case (Helo & Hao, 2019; Plisson, 2017). Permissionless blockchains have two main benefits. The first one is disintermediation: since blockchains are peer-to-peer networks, they reduce reliance on third parties. The second one is transparency: as the information within the ledger can be consulted by all participants and cannot be altered by a single authority, it creates trust and reduces fraud (Iansiti and Lakhani, 2018; Yli-Huumo et al., 2016).

On the contrary, in a permissioned (private) blockchain, verification nodes are known and identified by a central authority or database. It is fully controlled by one organisation and therefore considered as a centralised network – no one can participate without authorisation to do so. In contrast to public blockchains, validators on private blockchains are trusted parties

chosen by the owner of the network. There are no anonymous nodes validating transactions nor nodes receiving mining rewards, but it still relies on a consensus mechanism to ensure new blocks on the blockchain are validated. The consensus protocol is broken down into three steps. First, it determines whether to accept or reject a transaction. Then, it sorts all transactions within a timespan into a sequence. Finally, it verifies and saves the information into the blockchain (Olsen et al., 2019).

The last type of blockchain network is hybrid, which is a combination of both private and public blockchain. The blockchain is in that case under the control of a set of organisations in which the right of access can be open to all or limited to specific users (Helo & Hao, 2019; Plisson, 2017). In practice, it is difficult to address the practical requirements of blockchain applications by using fully public or fully private ledgers. It is necessary to coordinate both types into a solution. For example, a private blockchain is rather used for sensitive data, while a public blockchain would be used for data requiring a high trust level. Each organisation can manipulate access limitation by the two types of ledgers, without having to rely on a central authority (Wu et al., 2017).

2.2.3. Mechanisms

In a blockchain system, a set of transactions is registered onto a ledger over a given period, creating a block. Each block is linked to the blocks before and after it, 'chained' mathematically through a hashing function that acts as a digital fingerprint of data to lock it in place within the blockchain (Laurence, 2017). Once connected within a chain, the blocks become immutable: they cannot be altered or deleted by a single actor. Instead, they are verified and managed using automation and consensus protocols (Swan, 2015). The verification is managed by the blockchain nodes, also called computers, minors or users participating in the blockchain network. Each node holds the complete documentation of all the transactions ever recorded in that blockchain, without being able to control the data. When a new transaction enters the blockchain, the participating users in the network must assess and verify the history of the new requested individual block by performing algorithms. If a majority of the nodes reach a consensus to validate the history and signature, then the new block is accepted into the ledger and added to the chain of transactions (Laurence, 2017).

The blockchain operating process can be broken down into five steps.

The first step is triggered when agent A sends a writing request to an agent B in the blockchain ledger. Agent A's request is added to an information block and forwarded to the nodes, which are gathered in a network maintaining a set of shared state and performing transactions (Azzi et al., 2019; Desplebin et al., 2019).

In a second step, this information block is placed in the "queue". The validation of the block will require validation by consensus of the network users (Desplebin et al., 2019). Only when a majority of network nodes validate the transaction will it be ordered and packaged into a timestamped block (Azzi et al., 2019).

The third step is the validation. It is the key step of the operating process. The cryptographic protocol allows the validation of the block's information through the consent of the minors (the network users) without revealing their content, ensuring the verification of the integrity of the data (Desplebin et al., 2019). The protocol involves computational work in order to solve a cryptographic puzzle, which takes time and computing power to solve. The aim is to calculate a hash value of the transactions added to the new block (Olsen et al., 2019).

In the fourth step, as soon as the block is validated by the consensus of network users, it is time-stamped and added to the blockchain. This validation is irreversible. Because the block is added in a chronological manner (each block contains information about the previous block), it is impossible to modify a block without altering the entire downstream blockchain, making it immutable (Desplebin et al., 2019; Plisson, 2017).

As a final step, all network members, who have the same copy of the recorded information, make the blockchain accessible (Desplebin et al., 2019).

2.2.4. Limitations

Compared to traditional centralised architectures, blockchain technology has a lot of advantages. However, the technology still needs to be seen in light of some limitations that must be factored into any business case before adoption (Hughes et al., 2019; Olsen et al., 2019).

- Lack of privacy: having each node in the network maintain the complete record of transactions might be an advantage in a security context, but a limitation for use cases where privacy is essential.
- Security model: blockchains use public key encryption to authenticate and execute transactions. Although this process is very secure, it requires the use of a public and a private key. If a party loses the private key or inadvertently publishes it, the system will not have an additional security mechanism.
- Flexibility limitations: blockchain's immutable properties ensure transaction but can act as a barrier for use cases that require modifications of transactions.
- Latency: it is currently very computationally expensive to have all nodes within the network store the complete transaction history for all information blocks. Moreover, since cryptographic puzzles are difficult to solve, it takes time to validate and add new blocks to the blockchain which can cause delays.
- Governance: the distributed characteristics of blockchain can act as a significant limitation towards control and governance by organisations.
- Energy consumption: one of the main drawbacks of consensus mechanisms is that the computers in the network use a lot of energy to solve cryptographic puzzles.

2.2.5. Applications

Recently, the potential applications of blockchain technology in many industries have gained traction. Blockchain can take on the role of key regulatory players such as notaries, central banks, and other centralised trusted identity intermediaries (Wright & De Filippi, 2015). Furthermore, by providing an immutable ledgers solution through distributed software architecture and advanced computing technologies, blockchain also has the potential to develop applications related to different non-finance fields, such as the agri-foods industry (Tian, 2016), pharmaceutical manufacturers (Apte & Petrovsky, 2016; Bocek et al., 2017), healthcare (Esposito et al., 2018), education (Chen et al., 2018), and the luxury industry (Wang et al., 2019).

In terms of business applications, Gupta (2017) mentioned that permissioned blockchains are of particular value, as they offer 3 main benefits in line with businesses' needs. The first benefit is enhanced privacy, because access to transactions can be determined by the users' role/responsibility. The second benefit is auditability, because the shared ledger, which acts as

the only source of truth, improves transaction monitoring and auditing capabilities. Finally, having less nodes than in a public blockchain, private blockchain networks provide improved operational efficiency, since transactions are possible at a speed that matches the pace of the business, while consuming less energy.

To automate the execution of a specific contract, some blockchain models use what we call “smart contracts”, which are computerised transaction protocols that execute contract terms. These programs stored on blockchains run when predetermined conditions are met. Blockchains can therefore be programmed to automatically trigger actions (such as payments) between nodes. All users can instantly trust the outcome, without any time loss or intermediary party’s involvement. Each node within a network must therefore agree on the inputs, outputs and status impacted by the smart contract (Azzi et al., 2019; Iansiti & Lakhani, 2017; Yli-Huomo et al., 2016).

The process of verifying ownership of both physical and digital assets is an integral component of most businesses and systems. Non-fungible tokens, often referred to as NFTs, are blockchain-based tokens, each representing a unique asset, acting as irrevocable digital certificates of ownership and authenticity of these (Amazon Web Services, 2022). In this thesis, NFT is used to refer to the digital twin of a physical asset.

The connectivity of physical assets with their digital twin in a virtual domain is made possible using RFID (Radio Frequency Identification) tags or other elements enabled by Internet of Things (IoTs) allowing a connection within a network (Atzori et al., 2010). Such a connectivity would allow for a synergy with smart contracts so that processes associated with physical items (sale of goods, inventories, production, etc.) are automatically integrated into the accounts and automate the execution of accounting procedures within smart contracts (Dai et al. 2017).

In addition, when integrated with field-sensing technologies such as IoTs, blockchains can create permanent, public, and actionable records of the digital footprint of products throughout the supply chain. This improved transparency will ensure product traceability, authenticity, and legitimacy, all of which are critical to food, pharmaceutical and luxury supply chains (Wang et al., 2019).

2.3. Applications of blockchain in luxury fashion

2.3.1. Supply chain

At present, the structure of the luxury fashion supply chain is becoming increasingly complex, with an increasingly diverse range of stakeholders. This results in organisations not having a holistic view of their entire supply chain. Many luxury companies have established their own identities and systems to maintain global operational coverage and power to control their suppliers. Otherwise, they must rely on centralised regulators or intermediaries. This low transparency has been leading to many problems in supply chain mechanisms regarding security, traceability, authentication, and verification systems.

Furthermore, firms' environmental awareness has been increasing. Sustainability has been implemented in the supply chain to improve organisational performance. Due to a variety of factors, including inaccurate data or a lack of smooth information flow among supply chain members, data out-of-sync, and inefficiencies in meeting supply and demand, the process of achieving supply chain sustainability often does not run smoothly. These limitations occur primarily because the availability of data for each supply chain member is centralised and often kept confidential, so that it cannot be anticipated by other members (Parung, 2019).

Blockchain-enabled transactions offer a solution to these issues by providing transparency for participating companies. For example, a block can be created for every transaction from product manufacturing to distribution and sale. This level of transparency and visibility is essential to improve the traceability of products and ensure their authenticity and legitimacy. For real-time tracking, blockchains can be integrated with GPS and RFID tags (Abeyratne & Monfared, 2016). The mechanism is simple: manufacturers insert blockchain-enabled RFID tags in products to provide secure certification with messages that change with each interaction. This information is securely recorded on the blockchain without the need for a party to provide monitoring capabilities. End users can view the immutable history of an item as it goes through the different steps of the distribution network (Authena, 2021). All data recorded within the blockchain is distributed to all network members. Unlike traditional methods using third parties, transaction and activity recordings are therefore accessible to all members. Each participant can see the progress and location of the product and share the same information within the system (Kim & Laskowski, 2016).

This improved visibility provided by blockchain can also highlight sustainable practices along the supply chain and provide an auditable trace of the product footprint. This is especially attractive for industries where the source of the product is important, such as luxury. This offers the potential to increase consumer confidence in brands and companies (Loop, 2017; Olavsrud, 2016). The transparency achieved through blockchain can build trust in the luxury supply chain and revolutionise its understanding (Field, 2017). Moreover, with increased data visibility, supply chain stakeholders can better understand what consumers want and have a clear view on demand for a particular product. These features help organisations plan more accurate forecasts and make better decisions (Loop, 2017).

Blockchain can also play an important role in collecting stolen goods and avoiding fraudulent transactions such as counterfeiting (Apte & Petrovsky, 2016; Loop, 2017). Increased security is another motivating factor behind why blockchain is adopted in the supply chain as it protects against tampering, fraud, and cybercrime (Lohade, 2017; Burnson, 2017). To achieve security, both reliability and authenticity need to be established. These qualities take the form of data integrity, which is one of the key attributes of blockchain-based ledgers (Yli-Huumo et al., 2016).

Other benefits that blockchain brings to supply chain are efficiency and speed. The technology accelerates the transfer of data streams between parties (Bedell, 2016). Therefore, firms can reduce the time products spend in the transit process, improve inventory management (Barnard, 2017; Loop, 2017) and ultimately reduce waste and cost (Kharif, 2016).

Smart contracts are one of the key mechanisms for improving supply chain efficiency. Rules and consequences in smart contracts are defined in the same way as traditional legal documents, stating obligations, benefits, and penalties (Gupta, 2017). Contracts can be automatically executed by blockchain systems, enabling highly automated and simplified supply chain processes (Barnard, 2017). They are especially useful for more complex multi-vendor outsourcing arrangements, where several suppliers are jointly responsible for specific outcomes (Overby, 2016).

In comparison with public blockchain, a distributed and private digital register is often used for two reasons: (1) to organise a network for gathering data and (2) subsequently proving, thanks to this data, the origin and content of each element constituting the digital product identity. This record is shared between nodes that are all known and individually identified:

these nodes correspond to the players participating in the supply chain, typically suppliers, manufacturers, carriers, distributors, or even organisations (Hug, 2017).

Though blockchain offers several advantages in making the luxury supply chain more transparent, adding chips to every product is not the most sustainable practice, and requires extensive data storage and a high energy usage to record all ledgers in a safe environment, although still lower than for permissionless blockchains. In addition, blockchain allows retailers to ensure information is immutable, but it does not have the ability to verify the integrity and validity of the information initially recorded. This means that if a party along the supply chain inputs false information, it will remain in the digital file. Close monitoring and is therefore essential for the technology to be effective (Corlett & Hackett, 2021).

Furthermore, the transition from a traditional to a blockchain-traced supply chain might not be smooth due to some challenges and obstacles in the implementation process. Helo & Hao (2019) have identified several reasons:

First of all, the development and implementation lifecycle is very long. To get started with blockchain, luxury fashion companies need to have full knowledge and proficiency with the technology. Moreover, blockchain is still in its infancy in terms of industrial applications. There is a lot of uncertainty about whether blockchain is suitable for a particular industry, whether there are copyright issues, etc.

In addition, both the skills and the cost of practitioners are at a high level. Practitioners need long-term training and technical development. It is also important to recognise that blockchain-based industrial solutions assume the willingness of stakeholders to collaborate and participate. Consensus is needed, with a focus on driving value for everyone involved. Therefore, it is important to create a culture of collaboration within the luxury supply chain.

Another limitation relates to scalability, which slows down the early adoption of blockchain. Organisations must sacrifice efficiency to ensure security, as every computer connected to the network must process transactions. As a result, there is a high demand in terms of technical infrastructure, which is more expensive than traditional approaches.

Finally, current data privacy regulations do not apply to transaction data. Partners are allowed to use this data without it being protected. Therefore, it is very important to create boundaries for the potential applications of blockchain. In addition, the governance solution offered by blockchain grants the ability to define degrees of transparency through the use of public and private keys, allowing the defined ledger to be freely public or private, and thus ultimately open to many audiences according to custom configurations (Leloup, 2017). It is then possible to define levels of confidentiality (thus prevent companies from publishing transactions, but also from regulating which user has access to which type of information), and to define managers authorised to add blocks. Unfortunately, this is also subject to limitations such as the issue of data manipulation, since it would be a private and therefore centralised blockchain (Helo & Hao, 2019).

2.3.2. After sales

From a commercial perspective, product passports combined with blockchain provide the greatest advantage to companies who can expand their functional capabilities into different use cases. For those luxury companies, passport technology can build consumer confidence, create exclusiveness, support repurchases and allow for more sustainable and responsible practices (Amed et al., 2021).

In addition to supporting certification and traceability, some brands are leveraging blockchain or RFID technology to drive brand engagement, loyalty, and repetitive purchases. Prada is providing personalised information and purchase suggestions to customers who scan RFID tags embedded in their products on their mobile devices. Meanwhile, Paco Rabanne has launched the first RFID-enabled fragrance that allows you to connect your smartphone to an RFID chip to access digital content such as interactive games and educational features (Amed et al., 2021).

2.3.3. Second-hand

In the second-hand market, product passports can simplify operational processes by offering easily accessible digital twins and standardised product information. Through the blockchain, consumers can check and verify the state, authenticity, and ownership of the product (Authena, 2021). For example, a retail store can use the blockchain to register the identity of the original customer when selling them a luxury item. Afterwards, that customer can register the resale of that item to a second-hand customer on the blockchain. If programmed into the blockchain,

smart contracts can also automatically execute downstream transactions and reward previous owners for reselling the product. The reduction in resale value that may result from a break in the traceability chain might encourage buyers to register their ownership on the blockchain (Beaver et al., 2021).

In addition to supporting authentication and valuation in the second-hand market, blockchain also streamlines a previously manual process, reducing reliance on in-demand expert authenticators (Amed et al., 2021). Consumers can indeed verify the authenticity of their products without needing assistance from a specialist thanks to the blockchain, allowing them to maintain or increase the value of their products when reselling. The same goes for luxury brands, whose products can be authenticated without the use of internal resources, resulting in cost savings. (Beaver et al., 2021).

One of the possible features of a digital passport is to suggest prices for pre-owned items based on their history, including who has worn and owned the product, as well as their repair history. Certainly, the digital certification provided by the product passport will help increase trust in second-hand luxury goods and collectibles, with marketplaces such as Vestiaire Collective and The RealReal benefitting from it (Amed et al., 2021).

2.3.4. Existing solutions

Looking ahead to 2022, an increasing number of luxury fashion brands are set to ramp up product passport development across different B2B, B2C and C2C use cases. The drive to create supply chain transparency and adopt circular business models will drive demand and help justify scaling up pilot projects to mainstream applications. While the cost of some product passport technologies has historically been a pain point in expansion, that cost is now declining: the price of an RFID tag has fallen 80 percent over the past decade. One of the success factors for the widespread adoption of product passports is the industry's ability to set common standards. “Brands are competitive, and there is a lack of collaboration” said Tyler Chavaux, director of sustainability at Avery Dennison for RFID labelling and supply chain solutions. Currently, some digital passports only work on private ledgers, while others are open source and compatible across a range of applications. However, there are signs that players are starting to converge on some solutions, with Aura and Arianee mentioned in many of the discussions (Amed et al., 2021).

2.3.4.1. Aura

Aura Blockchain Consortium, the world's first global luxury blockchain, was founded in April 2021 by three major luxury players – LVMH, Prada Group and Cartier, part of Richemont, and was joined in October 2021 by the OTB Group. This unprecedented collaboration between competitors provides a single, innovative solution to the common challenges of communicating authenticity, responsible sourcing, and sustainability in a secure digital format. Given that these challenges are common to all luxury brands, it made sense for these competitors to work together to drive change and develop a shared solution. The goal is to provide consumers with a high level of transparency and traceability throughout the product lifecycle (Aura, 2021; LVMH, 2021).

More than 15 million tokens have been created so far to connect luxury products to the Aura blockchain (Pinnock, 2022). Among LVMH Maisons, Hublot, Bvlgari and Louis Vuitton are already active on Aura. For example, Hublot has introduced a digital electronic warranty, which is stored in the Aura infrastructure and allows customers to verify the authenticity of a watch with a simple photo taken on their smartphone. If stolen, the electronic warranty can reflect this status to prevent resale. Brands using Aura develop their own experiences based on their specificities and customer expectations. They also maintain their data and adhere to the strictest customer privacy standards. The information is stored on the blockchain in such a way that it cannot be altered, tampered, or hacked. Toni Belloni, Managing Director of LVMH, commented:

The Aura Blockchain Consortium is a great opportunity for our industry to strengthen its connection with customers, providing them with simple solutions and allowing them to better understand our products. By building on this project and joining forces with other luxury brands, we are leading the way in terms of transparency and traceability. I hope other prestigious players will join our alliance (LVMH, 2021).

The Aura Blockchain Consortium uses a unique code to provide verified product records, including ownership history, product authenticity data and provenance of materials. When a customer buys a product, they receive an encrypted certificate that contains information about the production process. Aura's state-of-the-art technology matches product IDs with client IDs, providing infrastructure through a chain of secure, non-reproducible digital blocks, and giving consumers access to product history and certification that allows them to evaluate its reliability

at every step of the value chain, from raw materials to point of sale. This information can be attached to products in various ways, including QR codes or RFID tags, which Prada has begun adding to its products. Consumers can therefore refer to reliable data to track the entire product lifecycle without the need for third-party validation. Aura can also serve as a storytelling solution for luxury brands to communicate directly with consumers, telling unique stories about material quality, craftsmanship and creativity, and strengthening client-brand relationships (Aura, 2021).

As for how the Aura system works, each new product is recorded digitally on a shared ledger, not replicable and containing unique information. At the time of purchase, consumers can use the brand's application to obtain the Aura certificate. The information from the certificate is carried over the years when a product is sold on a resale marketplace and subsequently purchased (The Fashion Law, 2019). In the future, the goal is to have many luxury brands joining Aura in order to create a standard that offers an additional layer of trust to consumers when they see the Aura logo. This trust can apply not only to brands but also to resale websites where certificates of authenticity and ownership offer a guarantee (Ott, 2022).

Easy access and affordability are also success factors in the product passport ecosystem. “The democratic process is very important so that we can create a governance structure and standards that work for both the small and big brand” said Timothy Iwata-Dori, Director of Global Innovation at Cartier and Member of the Aura Board of Directors (Amed et al., 2021). Being a multi-nodal, private blockchain secured by ConsenSys technology and Microsoft, Aura is sold as a Software-As-A-Service (SaaS) system to all luxury brands, not just founders, and offers flexibility to support businesses of varying sizes and adapt to individual needs. The service provides a white-label interface customisable for each brand's frontend and an easy-to-manage input system. This ranges from smart contract generators to easy-to-write web pages and product history management. This covers both upstream use cases (such as raw material procurement) and downstream use cases (e.g., digital certificates of ownership and authenticity certified on the Aura Blockchain, eWarranty, transfer of ownership, etc.), including features such as reliability, ownership, warranty, transparency and traceability, promising lower upfront costs, as well as low licensing and onboarding costs (PYMNTS, 2022).

While “track and trace” features have always been part of Aura's goals, the dramatic increase in digital and remote sales over the past years has made them even more important. Brands are also starting to recognise and participate in rental and resale, as well as experimenting with

digital apparel and NFTs (unique tokens on the blockchain). Franck Le Moal, chief information officer at LVMH, says Aura does not encourage brands to adopt specific use cases, but allows members to access a solution that provides a variety of capabilities throughout a product's lifecycle. In most cases, it is used to provide information on a product's sourcing and extends to post-sales (McDowell, 2021).

Aura is a private blockchain, meaning full access and control over the data are only granted to companies on the network (each brand is the only access holder to its brand and client data) (McDowell, 2021). One of the biggest benefits of a private blockchain is that all suppliers can add information to the same system, but only certain members can read it (PYMNTS, 2022). "I think it's essential to build trust. And this is why it is actually private permission based, so the brand can decide on what information they can give access to the consumer and the consumer can be sure that what is on our blockchain is from the real luxury brand." says Daniela Ott, general secretary of Aura (2022). Another advantage of a private permissioned blockchain is that Aura only operates on 30 nodes and knows where they are and their energy usage. Aura is going to reach carbon neutrality in 2025 because owners can control the energy used by the blockchain (Ott, 2022). Aura shows a significant development in the relationship between technology and the luxury industry, but it also raises questions about how to make private blockchain transparent without the open access aspect, and how brands with existing blockchain projects might proceed. Aura is an open consortium, but not everyone can participate. The operator can decide whether to hide or show the events to be tracked in the system, meaning customers can only see what the brand gives access to (McDowell, 2021).

2.3.4.2. Arianee

By creating a blockchain-based certificate and allowing other parties to grant it to the original owner of the product, Arianee adds a new layer of authentication on top of paper certificates, RFID, holograms, etc. Working with Richemont as an associate member, and Mugler, Vacheron Constantin, Breitling, Audemars Piguet and more as brands, Arianee adds a unique paradigm to the battle against counterfeiters: from now on, the ability to verify product authenticity and origin will be widely distributed to a range of stakeholders. Because it uses blockchain technology, assets are publicly published in a unique chain and linked directly to a single physical serial number. Now, instead of relying solely on brands, everyone can share the burden of guaranteeing product authenticity. Arianee focuses less on supply chain transparency and more on attracting customers after sale or resale (Arianee, 2021).

What makes Arianee unique is its public blockchain and open-source solution. This means that the code is published – brands can build their own interface, and people can contribute and build the code. The open-source protocol allows the public to gain total transparency. Private blockchain for tracing and tracking is a good idea, but the power of blockchain technology ultimately lies in decentralisation. This raises questions about the competitor Aura's closed control. “In order for users and third-party companies to verify product ownership and true transparency, that product identity needs to live on a decentralised, permissionless public blockchain” says Marjorie Hernandez, co-founder of the Lukso blockchain, centred around luxury fashion. “Open sourcing and decentralised infrastructure are the best way to build trust”, adds Antonio Carriero, Breitling's Chief Digital Technology Officer and member of the Arianee Project Association. For now, he considers Aura and Arianee to be compatible and complementary, not competitive. “Whether you use one or both depends on your brand's priorities” (McDowell, 2021).

Literature was not able to give further insights on blockchain applications in the second-hand market, and how the entire range of stakeholders would leverage them. This will be the main focus for the practical analysis, aiming to complete the literature and suggest new answers.

3. Practical analysis

3.1. Interviews

3.1.1. Methodology

In order to gain more in-depth and practical knowledge following the theoretical research, qualitative data was gathered through semi-structured interviews, based on an interview guide which served as a framework (see [Appendix 9.4](#)). These interviews allow for a better understanding of how blockchain can be used to fight counterfeiting in the second-hand luxury fashion market, by confirming, contradicting, and completing findings from the literature. The transcripts of the interviews can be found in [Appendix 9.7](#).

3.1.2. Participants

To conduct insightful interviews, different relevant experts were reached out to – luxury industry employees, second-hand marketplace owners, authenticators, regulators and blockchain providers (the complete list of contacts can be found in [Appendix 9.5](#)). Out of the 44 people contacted via intensive desktop research, by hunting directly on LinkedIn or via companies' websites, 7 responded positively, representing an acceptance rate of 16 percent.¹

3.1.2.1. Anonymous informant, Corporate Affairs Manager at LVMH

Experienced Public Affairs professional with a demonstrated history of working in the luxury goods industry, with expertise in intellectual property and distribution strategies and a strong interest in issues such as digital policy, competition, trade, employment, environment and sustainability, and cultural and creative industries.

3.1.2.2. Julia Chinakaeva, Research Director at BQ Intel

Julia Chinakaeva led a research effort on blockchain in fashion for BQ Intel. She formulated a comparison framework for use cases of blockchain collaborations in fashion and presented the final outcomes to industry leaders. She is now VP of Marketing for Sleeve, a fashion start-up working on made-to-measure technologies for brands.

¹ All descriptions of participants are taken from their respective LinkedIn profiles, websites, or information communicated by e-mail.

3.1.2.3. Graham Wetzberger, Founder & CEO at Luxury Appraisals & Authentication

Graham Wetzberger has appraised and authenticated over 200,000,000 USD worth of luxury goods. His authentication expertise grew from his education in Fashion Design and Art History. Graham was a pioneer in the online resale landscape, helping grow The RealReal into a billion-dollar business. He is now founder and CEO at Luxury Appraisals & Authentication, assisting resale companies with authentication and valuation and providing certification and training.

3.1.2.4. Alba Figueras De La Parte & Ataman Ersan, Co-Founders at Her-Age

Alba Figueras De La Parte and Ataman Ersan are co-founders of Her-Age, an online consignment shop for authenticated vintage and second-hand luxury fashion items. It is a safe and controlled marketplace – the team takes care of authenticating, pricing, and shipping the items, making it a hassle-free profitable experience. Her-Age protects the value and the memory of the item through an NFT holding its certificate of authenticity and its digital value. Once you buy an NFT eligible product on Her-Age, you not only get the physical product, but also become the owner of its NFT, allowing you to hold on to a virtually eternal worth that will grow independently from the condition of the original piece. Her-Age uses the digital wallet Virgo, developed by Her-Age's technology partner Luxochain.

3.1.2.5. Angela Cearns, CEO at TrueTwins

Angela Cearns is the CEO of TrueTwins, a blockchain solution that traces the authenticity origin and sustainability practices of luxury products. TrueTwins creates an ecosystem for all players in this distributed industry to document a product's activity, from birth to its end-of-life. Angela Cearns is also a professor for the European Institute of Commerce held at Churchill College, University of Cambridge. She is an experienced advisor who provides executives a balanced guidance based on theoretical frameworks and real-life practicality on innovation and digital transformation.

3.1.2.6. Daniela Ott, Secretary General at Aura

Daniela Ott is the General Secretary of the Aura Blockchain Consortium since its founding in May 2021. A qualified and recognised leader in the luxury industry, Daniela has over 20 years of experience spent in developing and leading interdisciplinary teams in the luxury industry. She was notably Chief Operating Officer for the Kering Luxury Division within the Kering Group.

3.1.3. Results

3.1.3.1. Second-hand luxury fashion market

After reviewing the second-hand luxury market in the literature, the role of luxury brands and blockchain technology in resale was discussed in primary research.

In general, luxury brands see the second-hand market as a great opportunity, emphasising the quality of luxury products, allowing them to be passed on from one customer to another and promoting sustainability. Luxury resale is also a way to reach younger generations who can't necessarily afford to buy a first-hand product. The main drawback of the second-hand market is that it has become an easy channel for counterfeiting. For this reason, luxury brands increase their involvement in resale in order to have more control over their products (LVMH employee, 2022).

According to Daniela Ott, Secretary General at Aura (2022), every luxury brand who wants to engage in sustainability and can afford it must make resale part of the equation. Hopefully, over the next 10 years, 20 percent of brands' revenue will come from resale or from circular business models. Brands will decide whether they will do it in-house, or whether to partner with third-party players (Ott, 2022). For instance, Gucci has launched their own online concept store, Gucci Vault, selling historical vintage pieces (Figueras De La Parte & Ersan, 2022).

Some think it might be too late for brands to come up with their own second-hand services: strong third-party players are already well established in the market with an offer covering several luxury brands, adding value for the consumers (LVMH employee, 2022). However, luxury brands have been collaborating with second-hand marketplaces, especially during COVID-19, for instance by donating or selling them their unsold inventory. For example, Alexander McQueen is selling their clothes on Vestiaire Collective, allowing them to keep their initial brand image and positioning (Figueras De La Parte & Ersan, 2022). Collaboration is the

best way for the primary market, especially for large consortiums of brands, to take more ownership in the resale world, as it allows them to have some oversight without launching their own resale services which could be cannibalistic for the brand (Wetzberger, 2022). Another reason why more luxury brands are not implementing resale into their current operating model is because it would dilute their brand value, and require more skills, more hiring, more brains, and more hands. They might have missed the mark, but some brands are just not capable of stretching out their service to resale, because it is a very different market (Chinakaeva, 2022).

The two main third-party players discussed in the literature, as well as in interviews, are The RealReal and Vestiaire Collective. For both of them, intermediaries are still needed to check on the products, avoiding the downside of C2C marketplaces where the final customer has no real proof that what they buy is what they will receive, implying a lot of CRM issues. If luxury brands implemented blockchain and individual digital twins for each product, it would be easier for customers to sell directly to peers, adding trust to the resale market (Figueras De La Parte & Ersan, 2022; Ott, 2022). With a C2C model combined with the digital passport technology, the certificate of authenticity would go from the first-hand buyer (becoming the seller) to the second-hand buyer directly without an intermediary (Ott, 2022).

Bringing blockchain into the second-hand market would reshape its business model. According to Julia Chinakaeva and contrary to the literature, the technology wouldn't be a threat to the specialised workforce, but rather a lever for these people to utilise their knowledge as a new resource, for example to curate collections, or to add old pieces from auctions to the blockchain, by authenticating and serialising them. Resale companies are currently making considerable investments in bulking up their teams, so they can scale up with the growth of the industry. They will still need qualified people to verify that what is on the blockchain matches the physical item (Wetzberger, 2022). Indeed, even if the blockchain is a trusted network, physical trust is needed first, especially for old high value pieces. Brands and resellers can therefore leverage experts to appraise the value of the products, instead of cutting their jobs (Cearns, 2022).

Resale companies could also create NFTs at that secondary point of sale, skipping the primary point of sale, meaning brands, and creating their own blockchain ledger. All in all, blockchain will not hurt the resale industry, but rather add trust to second-hand marketplaces from a consumer point of view (Wetzberger, 2022).

3.1.3.2. Counterfeit luxury fashion market

Industry experts shared their insights into the fight against counterfeiting, from the localisation of its manufacturing to its channels and consumers.

85 percent of counterfeit luxury products are manufactured in China (Wetzberger, 2022; LVMH employee, 2022). It used to be 95 percent, but the pandemic's impact on China has led countries such as Turkey or Vietnam to become new hotspots for the production of fake luxury goods (Wetzberger, 2022). The main problem for brands and groups such as LVMH is that it's nearly impossible to influence the production of fakes: whenever authorities collaborate with brands to get these Chinese factories to close down, new and improved ones appear just a few weeks later. The fight against counterfeiting therefore mostly happens on the distribution part of the value chain. It got harder with the rise of the Internet: counterfeiters who were selling fakes for 100 EUR on the streets of Barcelona now have access to websites where they can simply upload a picture of the real luxury good online and sell their fake version for 1200 EUR instead of 100 EUR. Customers started reacting negatively towards brands rather than counterfeiters, pledging to never buy from the brand again instead of blaming eBay, Facebook or whatever channel allowed the counterfeiter to deceive them (LVMH employee, 2022). This confirms Seuffer & Cieciela's findings (2020) – the increase in information asymmetry induced by e-commerce represents a risk for brands. The online sales of fakes on channels such as eBay make it harder to seize the products during shipping, because they're being shipped one by one rather than in containers full of fakes (Wetzberger, 2022; LVMH employee, 2022).

Social media also plays a significant role: 20 percent of all sponsored content related to fashion on Instagram promotes fake products (LVMH employee, 2022). On Reddit and WhatsApp, shoppers compare sophisticated fakes with the authentic version, promoting counterfeiting to their surroundings (Wetzberger, 2022).

Another reason for the growth of counterfeiting given by Graham Wetzberger, is that the quality of luxury goods is decreasing, while the quality of counterfeits is increasing, confirming the super fakes phenomenon. It's rare for counterfeits to be produced due to breaches in supply chains in the case of the luxury industry. Most of the luxury production takes place in Europe, and breaches usually happen in Asia. The luxury supply chain is also very integrated and limited in steps, giving brands a greater control to avoid losses, theft, or extra production for the grey market (LVMH employee, 2022).

Fake luxury stores are on the rise too in the non-deceptive market, selling high quality products for customers who want to fool their surroundings with a very resembling handbag, knowing it is fake but keeping it a secret. Some other customers also buy the fakes knowingly, to then sell them as real on marketplaces (Wetzberger, 2022). Alba Figueras De La Parte and Ataman Ersan, founders of Her-Age, receive a lot of counterfeits for consignment that were originally bought from peer-to-peer second-hand actors. Owners of these marketplaces are not controlling the market and opening the doors for people to sell fakes easily.

Brands are aware that not all counterfeit buyers constitute a loss in their own customer base: take for example teenagers who love luxury products but can't afford them and buy fakes before they can save money to buy "the real deal". For this reason, it's important to always view counterfeit consumers as potential future clients of the brand (LVMH employee, 2022; Cearn, 2022).

Brands have now shifted their focus from protecting the brand to protecting the consumer due to their increased vulnerability to counterfeits after a shift to online sales. It can be dangerous for shoppers' health to purchase and use counterfeit products – a fake handbag can be made using chemicals that are dangerous for the skin. Luxury brands therefore cite safety measures as a priority when fighting counterfeiting (LVMH employee, 2022).

Authenticators have machines where they can compare real and fake products. But these work better for hardware, such as watches or jewellery, compared to clothing or soft leather pieces for example where image recognition is harder. Clothing would for this reason be easier to counterfeit and sell as authentic (Wetzberger, 2022).

Can counterfeiting still happen with the implementation of blockchain? It would be much harder, because counterfeiters would need to forge the link between the physical and the digital. According to Julia Chinakaeva, it is unlikely that counterfeiters, even if they're qualified craftsmen, can manufacture chips and connect them to the registry of LVMH for instance. They could copy the QR code, similar to what is happening with the COVID-19 green pass. But if the serial number is incorrect, it won't match its digital twin. The NFT inside the digital wallet is impossible to copy – if someone steals a luxury product and scans the chip or code, they will immediately get caught because of the blockchain's tracing and tracking (Chinakaeva, 2022).

Graham Wetzberger thinks counterfeiters are smart: it only took them a couple of months to imitate Louis Vuitton's new tags on fake handbags. They even programmed the tags so that they would lead to what looked like the real Louis Vuitton website. Since then, brands have managed to buy all the fake URLs to redirect them to the genuine website. This shows that counterfeiters could go as far as forging the blockchain, giving them the highest level of credibility, and emphasising for brands the importance of educating customers about fakes. However, this would mainly concern highly sophisticated counterfeits, which are the exception in a market full of cheap fakes, with counterfeiters focusing on the appearance of the product to fool the customer rather than copying the technology. It would be too great an investment, both in terms of time and money. However, one must keep in mind that RFID, NFC and even blockchain technologies are getting more affordable (Wetzberger, 2022).

Interviewees provided contradicting opinions about the efficacy of regulations against counterfeiting. According to Graham Wetzberger, authorities have not always been helpful towards the fight against counterfeiting. Local governments tend to be more ruthless when fakes are being sold in their own country, teaching their inspectors how to stop their circulation within the borders. However, it's only worth it to open a legal case against the counterfeiter when it's an actual business case – meaning a lot of fakes, sold for a large amount of money (Wetzberger, 2022). Angela Cearns, CEO of TrueTwins, believes that regulations towards counterfeiting are well established: she affirmed there are enough policies and rules in place to fight it. There are a number of different legislative tools, but the larger framework is mostly set up on a European level. Member states of the E.U. have also adopted their own versions of that legislation (LVMH employee, 2022). In the United States, responsibility falls on third-party marketplaces. If they allow a vendor to sell counterfeits, they must turn over the information about the vendor to the party suing or claiming intellectual property infringement. In Europe, regulations towards luxury counterfeiting are stricter due to a lot of the luxury houses' presence, punishing not only the counterfeiter, but also the buyer of counterfeited products (Wetzberger, 2022).

3.1.3.3. Applications of blockchain in luxury fashion

During interviews with industry experts, questions were asked about potential applications of blockchain in luxury. Julia Chinakaeva made an interesting analogy:

I don't think we understand what we can do with blockchain. I think someone said, and I very much like this analogy, that blockchain is like people discovering fire in the beginning, but they had no idea how it would actually completely change society. So, I think we're still at the discovery stage of the fire. (...) we're gathering together, cooking food on it, but we don't know about the industrial revolution, we don't know about all the other consequences and steps of the technology (Chinakaeva, 2022).

Most answers aligned with what was learned from the literature, highlighting traceability and authenticity as the two most promising applications for luxury.

For traceability, blockchain could provide detailed information about value chains to answer customers' and legislators' increasing need for honest and transparent storytelling (LVMH employee, 2022). Lower-end brands would benefit the most from the traceability application, because their customer base is usually younger and more environmentally cautious according to Julia Chinakaeva's research. They want to know for certain that their purchases are not contributing to environmental damage and unethical practices. However, tracing the supply chain for these slightly lower-end brands isn't an easy thing to do, as they are usually not vertically integrated: they don't own their factories and don't have much control over their supply chain, making it a challenge to enter it all on the blockchain. For higher-end brands and groups such as LVMH, it's easier, as they usually already have their data in one place and only have to build the ecosystem to share it with consumers through the blockchain (Chinakaeva, 2022).

Blockchain can also help take the fight against counterfeiting to the next level by certifying the authenticity of products. Higher-end brands would lean more towards the authenticity application than traceability, as authenticity usually aligns more with their customers and other stakeholders (Chinakaeva, 2022).

The difference between regions was highlighted in the interview with Angela Cearns. Europe is more environmentally conscious and is housing more conversations about blockchain for traceability of the supply chain, while stakeholders in the United States tend to care more about

authenticity. Having worked with brands interested in the technology, Angela Cearn's shared that the business case was often directed towards authenticity, because it is easier to apply in most cases and can protect brands from the revenue loss caused by counterfeiting. Graham Wetzberger considers blockchain for authenticity as an added value for brands and consumers because it is tamper-proof.

Both applications can be combined in one solution according to Julia Chinakaeva, but it would be a more complex and expensive exercise for brands.

Blockchain technology can also enhance customer experience in the luxury industry through personalised suggestions, interaction, and engagement. It can serve as a solution for storytelling and customer support (Wetzberger, 2022).

NFTs and Metaverse were often brought up in interviews as trendy topics in the blockchain space for the luxury market. You could buy a product both in its physical and digital form, so that your avatar in the Metaverse would be wearing the same luxury watch you keep in a safe in your house. Brands are using precise 3D renderings using thousands of data points to create the digital version of a product (Wetzberger, 2022). According to Angela Cearn's, digital will end up being more profitable than physical. Brands might therefore focus on NFTs that are easier, faster, and cheaper to implement as a business model compared to adding chips to each physical product. There are however still some questions concerning the value of a digital NFT without a physical counterpart.

All these applications can extend themselves to the second-hand market, to continue the storytelling throughout the life of a luxury product, connect owners of a same product, and create trust within resale (LVMH employee, 2022; Ott, 2022).

Her-Age, the second-hand luxury online marketplace whose founders were interviewed for this research, uses NFTs that hold the certificates of authenticity and the digital value of a physical item through blockchain. When buying a second-hand item from Her-Age, the customer therefore receives both the physical and digital value of the item, that can grow independently in a secure environment (Figueras De La Parte & Ersan, 2022).

3.1.3.4. Private or public blockchain

The literature and interviewees were divided between a public and a private blockchain as the best solution to verify the authenticity of luxury goods.

On the one hand, the anonymous LVMH employee shared that the entire added value of blockchain was its decentralised aspect – that is what makes it difficult to modify the data. Whereas in the case of a private blockchain with centralised authority, if the provided information about the product is incorrect from the start, it could still be corrupt (Chinakaeva, 2022). Angela Cearns shared that public blockchains have a better infrastructure to support the interoperability and collaboration of different stakeholders. On the other hand, she confirmed that public blockchains are very resource intensive, which is contradictory when blockchain is used for sustainability purposes.

Aura, the blockchain consortium developed by LVMH, Prada and Richemont, is a private permission-based blockchain. This means that brands have the freedom to decide what information customers can access. Unlike a public blockchain, Aura's technology is not energy intensive as it only runs on a few nodes. Governing members know exactly where these nodes are sitting, as well as what kind and how much energy is consumed during the validation process. Privacy is also essential for publicly quoted brands that list their products on the blockchain because they cannot openly display how many units they produce. If they have a drop in production, it will impact the share price, which justifies why the information shouldn't be public. However, the necessary information is given to the customer to make resale more efficient. Furthermore, although it doesn't have the decentralised advantage of a public blockchain, all of Aura's founding members must validate the nodes, making it difficult to tamper the data (Ott, 2022).

The main takeaway is that it's hard to have a perfect solution that is either public or private. Each side has its advocates, with Aura representing the private and Arianee the public. Daniela Ott believes that every brand should decide which player to go for according to their values and needs.

3.1.3.5. Digital identity of luxury fashion goods through blockchain

While the literature gave some valuable insights into the blockchain technology, conducting interviews allowed for a better understanding of how that technology would be applicable in practice in the second-hand luxury fashion industry.

Linking the physical product to the blockchain is the trickiest part of the process. A scannable chip, using RFID or NFC technology for example, can be attached to the product during manufacturing for this matter. RFID is often used in tandem with blockchain because it gives the real time location of the asset (Chinakaeva, 2022). A lot of luxury brands have already been implementing NFC and RFID tags, but mostly for inventory control rather than for customer service purposes (Wetzberger, 2022; Cearns, 2022). Right now, the chips are only leading to code, but they could be leading customers to the website or different engagement media (Wetzberger, 2022). A QR code can also be used to link the product to its digital twin. The code can either be printed on the product, if washable, or on a separate card provided with the product (Figueras De La Parte & Ersan, 2022). The problem with QR codes, NFC, or RFID chips, is that they're usually not differentiating individual products, but rather batches of products for inventory purposes. To give a unique identity and an authenticity certificate to each product, the code linked to each individual chip would need to be unique (Cearns, 2022).

Researchers have also been looking into physical fingerprints for products, using ink for instance, to differentiate one product from another within one single batch. A more costly solution would also be for brands to produce a unique digital device attached to the product, as well as a device to read it solely owned by the brand. Without this device, it would be impossible to read the information, making it harder for counterfeiters to copy (Cearns, 2022).

Every brand can decide where to start its journey on the blockchain, and how to provide a customer-facing experience, with regards to the information shared about the luxury product. Brands must find their own way to give a unique identity to their products, such as a unique serial number. Without their participation, blockchain doesn't work (Ott, 2022). For example, a brand provides the Aura Blockchain Consortium with an Excel file gathering all the units produced and their corresponding serial numbers. Obviously, it's easier when it's only a couple thousand units – it gets trickier when we're talking about hundreds of thousands, for which a full API (Application Program Interface) set is provided to manage high volume ingestions (Ott, 2022).

The unique NFT linked to a physical product serves as a digital certificate to prove authenticity and gives relevant and precise information about the product's lifecycle. It can be the name of the product, the date of production or first sale, the original price for example (Chinakaeva, 2022; Ott, 2022). It is up to the brands to define this information and map the lifecycle from product inception to resale (Ott, 2022).

This information can be shared to the second-hand marketplace when the owner decides to sell the product. Between the blockchain provider and the resale player, there must be an API to authenticate the item, approved by the brand. Luxury brands need to create a user account on their CRM system for each buyer. When the first-hand buyer resells their product, an account would be created for the second-hand buyer to give them access to the data. The brand benefits from capturing the new buyer's data, which is another added value of linking first-hand and second-hand for brands. The digital certificate is then sent to the second-hand buyer, and the product gets shipped. When receiving it, the buyer needs to make sure that this item corresponds to the one in the certificate. This can be done with their phone by scanning the chip on the physical product (Ott, 2022).

Customers do not have direct access to the blockchain, only to an interpretation of it that could be an app serving the purposes of resale or storytelling (LVMH employee, 2022). According to Angela Cearns, an app needs to be intuitive and interacted with often to work. By combining ownership certificates with the full storytelling of products, after sale services etc., brands could get the engagement needed from customers.

If the participation process is too manual, lengthy, or costly for resale actors, they probably won't be taking part in it, because they're already operating on very small margins as it is. If they receive a vintage item and have to add it manually to the blockchain, it just adds to their workload (Wetzberger, 2022). This raises the question of whether the blockchain would then only work for newly produced items.

3.1.3.6. Luxury fashion brands and blockchain providers

Another grey area that needed further investigation through interviews was whether brands would be willing to collaborate on a blockchain solution, or if multiple players would emerge from the trend to fit the various needs of brands.

Right now, the market is divided in multiple blockchain providers. Brands can decide to develop their own technology or collaborate with an existing provider, as it was seen with Aura (Figueras De La Parte, 2022). Julia Chinakaeva, Graham Wetzberger, and Angela Cearnas believe having different solutions is a waste of effort and that they will be clustering soon enough. From a customer point of view, the different technologies need to be integrated with each other to provide the best experience. However, Julia, Graham and Angela do not see one player emerging as a market leader, rather an oligopoly of technology providers based on competing luxury groups who have the financial power to develop them. It could be dangerous to have one company holding the keys to the technology and using it as a playground (Chinakaeva, 2022). Graham Wetzberger shared that Kering and LVMH are ‘enemies’, and it’s quite unlikely that Kering would join Aura. But Kering is the one that has a share in Vestiaire Collective. It will therefore be interesting to see how the situation will play out regarding these major actors (Wetzberger, 2022).

Angela Cearnas highlighted the power of blockchain that enables collaboration between a wide variety of stakeholders and even competitors. The technology in itself is less important than the willingness of brands and their industry stakeholders to collaborate (Cearnas, 2022).

According to an LVMH employee, Aura can be tailor-made to what brands want to use blockchain for. It is really a solution by and for the brands, in the sense that only member brands can use the Aura blockchain to authenticate their products (Ott, 2022). Second-hand actors are not members of Aura – second-hand shoppers would go to the blockchain app for their authenticity certificate coming from the brand (Ott, 2022).

Because blockchain providers are not always compatible or interchangeable, brands have to choose which solution to go for and might have to do so quickly if the technology penetrates the luxury fashion industry on a global scale (Ott, 2022).

3.1.3.7. Regulation of blockchain

Because the blockchain technology is still in its early stages, literature was not able to provide reliable data about regulation on blockchain solutions. It was therefore investigated further through interviews.

It is likely that blockchain technology will end up being regulated in the future, under broader principles made for supply chains (LVMH employee, 2022). There have been discussions on a scoring system for every country in terms of blockchain regulations, but not for particular players (Chinakaeva, 2022). It most likely won't be mandatory for brands to be part of a blockchain solution. A difference has also been made between Europe and the United States. In the US, there is a tremendous believe in freedom, leading the economy to drive what is needed and slowing down regulation and policies compared to the market. In Europe, it is possible that a regulation will be introduced as a testing ground in certain countries, and that brands will use it as a pilot to understand how to incorporate the technology with this regulation and see how it impacts the business (Cearns, 2022). In general, regulations and policies have not been good at preventing monopolies from happening (LVMH employee, 2022).

3.2. Scenario analysis

In this section, uncertainty variables are identified based on the primary and secondary data that was collected. After elimination of correlated variables, the most impactful variables are selected. These variables can help sketch out scenarios for the future of blockchain for authenticity in the second-hand luxury market. There are many directions that the industry could go in, impacting the involved stakeholders in different ways – while predicting the future is difficult, through this holistic approach, the aim is to highlight the directions that are most likely to be taken in the near future.

3.2.1. Variables identification

The level of knowledge obtained after comparing and completing the literature with interview results enabled the identification of uncertainty variables. Based on a framework by McKinsey, all these variables define uncertainty through a range of possible outcomes whose probability cannot be objectively assessed with the available data at this stage (Courtney et al., 2000).

3.2.1.1. Brands developing in-house second-hand service versus brands collaborating with existing resale marketplaces

First and foremost, the 33 billion EUR second-hand luxury fashion market was identified as a major opportunity that might interest luxury brands directly. Currently, consignment stores and online resale-as-a-service dominate the space, with digital players growing fast. Brands are not unaware of this success, with strong partnerships between marketplaces and prestigious brands emerging. Are these partnerships here to stay, or rather just a way for brands to test the resale waters before fully entering the market on their own? This leaves us with a situation of uncertainty: would brands take advantage of their reputation and introduce second-hand in their business model by developing resale-as-a-service in-house? Or would partnerships and collaboration between resellers and brands grow stronger, letting second-hand fashion luxury goods providers such as The RealReal or Vestiaire Collective dominate the market?

This variable can take values within a range of possibilities, with the two extremes being brands having their own in-house second-hand service on the one end, and brands collaborating with existing resale players on the other end. Between these two extremes, there would be an array of hybrid situations with both third-party and in-house resale.

3.2.1.2. Competition versus collaboration of blockchain providers

Currently, several blockchain players aim to offer a solution ensuring traceability and proving authenticity for luxury brands. This variable represents the degree of collaboration between those blockchain players that we could see in the future. It is uncertain whether all luxury fashion brands will join a single blockchain, or if providers will multiply to cater to the unique needs of individual brands.

This variable is binary, with one alternative being a market with multiple blockchain providers, and the other being only one standardised solution for all brands.

3.2.1.3. Public versus private blockchain

Opinions differ on whether luxury brands should use a public or a private blockchain, as both have their own benefits and disadvantages, corresponding to the unique needs of luxury brands. This variable will enable the definition of scenarios where brands will choose to implement either public, or private technologies.

From an actor perspective, this variable is binary as well, with public on one side and private on the other. Brands can indeed only opt for one option. If we look at the variable from a market perspective, we could have a hybrid situation where both public and private blockchains are available for brands to choose from.

3.2.1.4. Counterfeiters having the skills to copy the technology versus staying behind

When looking at the market of luxury fashion counterfeits, it is interesting to evaluate the impact blockchain might have on manufacturing and sales of fake goods. On the one hand, it was made clear that counterfeiters were getting smarter and harder to catch, with the internet and social media acting as facilitators – they could go as far as copying the blockchain technology to continue taking advantage of this high-grossing space. On the other hand, counterfeiters might not have the knowledge and resources to manufacture individual chips and forge the technology, forcing them to stay behind and give up the high-quality production of fakes that can deceive consumers or cannibalise luxury sales.

This uncertainty variable is a set of two potential values. The first option is a majority of counterfeiters going forward and copying the technology. The second option is a majority of counterfeiters staying behind by not copying the technology.

3.2.1.5. Blockchain for physical luxury goods identity versus digital luxury goods

Luxury brands and groups are only starting to dig into the world of possibilities that blockchain can offer. While blockchain for traceability, authenticity and ownership certificates of physical products are common applications, brands have also been looking at fully digital tokens. Consumers could purchase luxury NFTs that only exist in digital format, for instance to wear in virtual realities. Some customers purchase the ownership of a product that is locked inside a safe – only giving them access to the digital counterpart of the physical product. Considering the focus of this research is on luxury fashion, it can be assumed that these goods are produced with the intent to be worn and used physically. It is uncertain which of these applications will be preferred by brands for investment, or which will interest the consumer more.

This variable starts on one extreme with brands investing in fully digital products, evolving into the other extreme where physical goods would be linked to their digital twins. Between these extremes, hybrid situations can occur.

3.2.1.6. Digital identity per individual item versus per product

Throughout this research, the linkage between the physical product and its digital twin imposed itself as a problematic. It would require a considerable investment for brands to individually tag each item they produce – but doing so would be necessary to transfer ownership of an item throughout its lifecycle. Brands must determine the precision of their tagging system depending on the resources they're willing to spend, influencing the potential applications of blockchain.

This variable has 4 potential nominal values. The first one would be brands producing the same chip for all their products, no matter the category or production date – the certificate would only give the name of the brand. The second one would be different tags for different product categories – handbags, shoes, or clothing for instance. A third option would be to tag specific products – a Hermès Birkin bag. The fourth and last option would be to tag each individual item – the exact one the customer is purchasing.

3.2.2. Variables orthogonality

Before proceeding to the construction of scenarios, correlation between variables must be assessed. Correlation would indeed indicate that variables are not independent – the movement of one variable would influence the movement of the other. Although it is not possible to test correlation in a statistical manner because of the qualitative nature of the data, some variables show obvious signs of correlations.

The variable relating to brands investing in physical versus digital luxury goods might impact counterfeiters' reaction towards the technology. If brands decide to prioritise the release of digital NFTs rather than invest in giving a digital identity to all their new products, counterfeiters can keep on counterfeiting without copying the technology as physical products will stay unprotected without the blockchain.

It seems like the last variable highlighting the level of product tagging from brands could also influence counterfeiters' counteraction. The more narrowed down the product tagging, the harder it would be for producers of fakes to copy the tag, increasing the likelihood of them staying behind.

The physical versus digital (3.2.1.5.) and level of tagging (3.2.1.6.) variables are therefore not considered for further analysis, only keeping the variable relating to counterfeiters having the skills to copy the technology versus staying behind (3.2.1.4.).

3.2.3. Variables prioritisation

After removing the two variables correlated with counterfeiters' skills to copy, the impact of the remaining ones on the different stakeholders (blockchain providers, luxury brands, second-hand players, consumers, and counterfeiters) can be measured. The complete analysis is provided in [Appendix 9.6](#). The two variables having the most impact on stakeholders, chosen to build scenarios, are:

- Blockchain providers competition versus collaboration (3.2.1.2.)
- Counterfeiters having the skills to copy the technology versus staying behind (3.2.1.4.)

3.2.4. Description of scenarios

The following four scenarios are defined, resulting from the combination of the extremes of the two selected variables. This allows to envision an envelope of possibilities, with multiple hybrid scenarios that could occur between these extreme situations.



3.2.4.1. If you want to go far, go together

In this scenario, brands will join forces to develop one blockchain standard for luxury fashion, while counterfeiters won't have the necessary skills to align with brands and copy the link between digital and physical.

Blockchain providers will therefore all slowly die out, with the exception of one market leader – that can be one of the consortiums already leading the trend, such as Aura or Arianee. Luxury brands from different groups will have to overcome competing interests. We can think of LVMH and Kering burying the hatch to work together on blockchain and provide the best customer experience possible. They will still be independently responsible for providing a track-and-trace system. This can be a risk from a regulator's perspective – having one player

lead the market and block new entrants is often not well perceived by regulatory authorities. It is not certain, however, when regulators will start monitoring the market, but it can be inferred from similar innovations that regulation may not be adopted until after a monopoly has been formed. An additional risk is that hackers are attracted to large technology providers dominating the market. They might target the luxury blockchain, getting access to private brand data. The risk is higher if brands settle for a private blockchain, as it is easier to corrupt than a public blockchain.

Second-hand sellers, whether C2C or with consignment intermediary, will benefit from having a standardised blockchain for all luxury goods sold on their marketplace. They will only require one API (Application Programming Interface) to communicate with the blockchain.

Customers will also have it easier: standardising blockchain in the luxury fashion industry can improve their confidence and trust in buying, especially in the second-hand market. With one single blockchain, there might only be one single app or website serving as a passport for all the luxury goods a customer owns, no matter the brand or who they bought it from. This is ideal for shoppers who are not loyal to a specific brand but enjoy luxury in general.

Counterfeiters, who already don't have the skills to copy digital twins, will struggle even more facing the strong alliance of brands. However, keeping in mind that a large part of the market consists of shoppers who intentionally buy fakes (high quality or not), counterfeiters will most likely pursue their activities, but will have to go after these customers in different ways as second-hand marketplaces that will participate in the blockchain won't be accessible anymore.

3.2.4.2. Brands wasting resources

In this scenario, brands are seen evolving in different ways regarding blockchain while counterfeiters will not have the necessary skills to evolve in the same direction.

Even more technology providers will enter the space, leaving luxury brands with an array of options that they will be able to choose from according to their specific needs. Brands within a single luxury group can even go for different providers, just like it can be seen now with the Richemont group that has brands working with Aura and others with Arianee. A high degree of competition is therefore expected between tech companies providing the blockchain interface. Some brands might even develop their own interpretation of the technology in-house

to have more control over their data and avoid mingling with competitors. The industry will not settle for a common standard but will focus on personalisation to give brands full ownership of what they want to use blockchain for – some may focus on traceability, others on authenticity or storytelling. From a regulatory point of view and to protect from hackers, this is a safer option.

Second-hand sellers, whether online or offline, will have to partner with the different providers through separate APIs to be aligned with the multiple blockchains and brands. That will require much more time and investment from them and won't be as efficient as having a standardised blockchain across the industry.

If some items in second-hand shops or websites are on the blockchain, and some aren't, it makes it difficult for customers to give their full trust. Consumers most likely won't be aware of the mechanisms of the technology and the differences in usage between their favourite brands.

At the same time, because counterfeiters won't have the skills and knowledge to go as far as copying the technology for their high-quality fakes, they will have to find other ways to fool the customer or focus on the segment of customers that intentionally buy fakes. If major second-hand players partner with all the different brands and their blockchain providers, there will be less room for owners of replicas to place their fakes on these second-hand marketplaces. But without a common standard, a lot of second-hand shops might not keep up with the technology, opening the doors for traders of luxury fakes.

Overall, this scenario will most likely lead to brands wasting a lot of money and resources to follow the blockchain trend considering counterfeiters won't conform anyways. Blockchain might be used for traceability, storytelling, and ownership certificates rather than to actively fight counterfeiting. Intentional buyers of replicas won't be stopped so easily – as mentioned in the analysis, brands don't go after them as they might turn into customers in the future. Because it will be much harder for sellers of fakes to fool customers on recognised marketplaces due to blockchain, this smaller segment will presumably die out.

3.2.4.3. Teamwork doesn't make the dream work

This scenario represents the case in which luxury brands will collaborate to work on one standardised blockchain provider, and where counterfeiters will have the required skills to copy the technology, allowing them to pursue their activities.

In terms of blockchain, this means that even if providers combine their knowledge and resources to build one central solution, counterfeiters will still find a way to copy it, adding a digital identity to their fakes, giving them the highest level of credibility and deceiving luxury consumers. For luxury brands, this means taking the risk of collaborating with competitors and working together on a solution that might not be so efficient as counterfeiters will copy it. It also poses a danger of letting a single blockchain provider have all the power over the technology, especially with a private blockchain, as it is not decentralised. Furthermore, as already mentioned above, this represents a huge potential for hackers that tend to be attracted to large technology providers dominating the market. Nevertheless, competition regulations tend to prevent monopolies from occurring, but might react too late or not be efficient enough.

Moreover, counterfeiters may find the technology easier to copy, as there will only be one standardised solution. Once they figure out how to replicate it, they will use the same fake blockchain for any product from any brand. However, this does not necessarily imply that counterfeiters will continue to produce and sell luxury dupes. Even with the right competencies, if they consider it to be too expensive in resources, they can decide to stop their activities. The literature highlighted that luxury counterfeiting was extremely lucrative due to its high margins, and that it was often financing criminal activities. But if it becomes too expensive, margins will be lower, and counterfeiters might turn to other illegal businesses to finance these activities. On top of that, since all brands will be on the same blockchain, the pressure on control will be stronger, making it almost impossible for counterfeiters to succeed.

As mentioned in the first scenario, second-hand marketplaces will benefit from a standardised blockchain, requiring only one partnership with a consortium of brands and a single API, which can also act as a barrier for counterfeiters, who cannot be part of this API.

From a customer point of view, one blockchain solution facilitates the user experience and educates them on how a blockchain-approved item should look like, allowing them to recognise counterfeits more easily.

3.2.4.4. If it is to be, it is up to me

The final scenario illustrates having more than one blockchain provider in the market, and counterfeiters having the skills to copy the technology.

This case allows the market to have both public and private blockchains, and brands to choose one based on their values and needs. This also means that brands can leverage a certain competitive advantage by choosing a particular blockchain provider. However, in this case, counterfeiters have the necessary skills to reproduce the technology. Having different blockchain solutions will already be an additional layer of protection in this regard, as one needs to know which blockchain to copy for each different brand.

Regarding second-hand players, this will impact their partnerships. If a luxury company owns shares in a resale marketplace, it will probably not allow them to use other competing blockchains, reducing the number of brands they can offer to consumers. Once again, regulation can intervene and control cross-ownership, which will help second-hand marketplaces continue to sell multiple brands. If they are allowed to work with different blockchains, they will have to manage different APIs, also affecting their customers, especially if those blockchains try to be as different as possible to demotivate counterfeiters.

4. Recommendations

4.1. If you want to go far, go together

We believe this scenario to be the ideal one for brands – building a standardised blockchain is their strongest shot at fighting counterfeiters, improving the customer experience, and showing involvement in the second-hand market.

The standardised solution should be a private blockchain for sustainability reasons and to ensure the protection of brands' data. It was made clear in the research that a public blockchain could reveal information that might impact a brand or group's share price. Brands should be able to control the data going on the blockchain, up to a certain level: ensuring transparency is still a crucial aspect of blockchain that needs to be adapted to a private infrastructure. A private blockchain also means a higher risk of hacking, which is why governing members should establish a strong security system and collectively invest in cybersecurity.

To appease regulators regarding the threat of a monopoly, the governance of the standardised blockchain must be as decentralised and impartial as possible. What Aura is doing seems like an appropriate way to do it: all member brands have an equal say in the governance of the blockchain. Although LVMH was the initiator of the consortium, it seems like it doesn't have more influence than others on the control of the technology. All brands should have an equal right to join and manage the consortium.

Regarding customers, they should be educated on the impact of the technology on their purchases. If Aura becomes the standardised solution for instance, the Aura stamp should be recognisable on all marketplaces to let them know that the luxury good is safe to purchase. To provide them with a seamless experience, it would be recommendable to have one single app or website gathering all their certificates of ownership, no matter the brand or luxury group. This would mostly benefit luxury consumers who are not loyal to a specific brand.

4.2. Brands wasting resources

Because brands will individually invest a lot of money and resources in blockchain technology, whereas counterfeiters won't, there is a potential to make blockchain a multifaceted tool offering brand new customer experiences, making resale and repair easier, telling stories about the history of a product and the brand, enhancing the product's digital value. If brands go for the individual route, we recommend they go all the way, and deliver a highly personalised experience that matches the personality of the brand and its customers. This would mostly benefit the very loyal shoppers who are passionate about specific brands.

In this scenario, second-hand marketplaces will have to deal with the diversity of blockchain providers with individual APIs. Because there will be less of a need for authenticators, we recommend redirecting this part of the workforce towards the relationship with the brands and blockchain providers.

Because of the multitude of luxury blockchains that will be on the market, it would be crucial to find a way to make the process smooth and seamless for customers. They will not be aware of which brand uses which provider, so coming up with a simple way to show that a luxury item's authenticity is certified is imperative. Instead of saying "Aura certified" or "Arianee certified" for instance, the mere mention of an item being on a blockchain would be more straightforward for shoppers who do not particularly know about the players.

4.3. Teamwork doesn't make the dream work

As counterfeiters will have the skills to copy blockchain technology in this scenario, and that there will be only one blockchain to copy, luxury brands should ensure the protection of their processes by making them difficult and expensive to copy. Indeed, profit remains the main motivation for counterfeiters. Protection can be achieved by using expensive chips to link the product to its digital twin and making them hard to recognise and copy by concealing them as well as possible within the physical article. They can add layers of protection by making unclonable chips and using cryptographic techniques as seen in the literature. They can also make them impossible to read without a specific device that only they possess. Blockchain providers, on their end, should add extra tiers of security to the solution, not letting anyone outside the consortium see the technology behind it. However, this adds issues relating to transparency, but remains possible with a private blockchain infrastructure.

As for second-hand marketplaces, they should focus on controlling the trade of goods from counterfeiters who attempt to implement digital certificates with fake blockchains. In this scenario, we believe a C2C model without intermediary would not be entirely feasible, as second-hand actors should still play a role in verifying the authenticity, not only of the product, but of the blockchain too. This could be done by current second-hand authenticators, who will have to extend their knowledge and be trained in blockchain technology. On the other hand, this control would still be reasonable, as there would only be one standardised blockchain to compare fakes with, which can facilitate the authentication process, and make counterfeit items more difficult to sell.

Similarly to the “If you want to go far, go together” scenario, the blockchain stamp should be standardised over all points of sale and resale, and all certificates should be gathered in one product passport app or website.

4.4. If it is to be, it is up to me

In the case of counterfeiters evolving in different ways regarding blockchain, and counterfeiters being able to copy the technology, we have several recommendations to protect second-hand from counterfeiting.

Choosing a private blockchain might be more efficient to fight counterfeiting. We therefore recommend brands to choose either just a private blockchain, or both a private and public blockchain, but not just a public one. As discussed before, a private solution will enable brands to keep their technology and data as secure as possible, as it is only accessible to them. No one can participate without permission, which is crucial in a scenario where counterfeiters have the skills to copy the technology. However, as private blockchains are easier to corrupt than public ones, brands should be careful and ensure the trust of their chosen participating users.

In addition to having different blockchain solutions, brands should use different tagging technologies to implement the digital certificate in the physical article. That way, it will be harder for counterfeiters to know how to copy a specific brand – they would have to start by discovering on which blockchain they are and what type of chip they're using. The strategy of making the link between physical and digital as expensive as possible as an additional safety barrier also applies here, but is less necessary than with a single blockchain solution.

As they will have different APIs with the different blockchains, it might be harder for second-hand sellers to recognise counterfeits. Resale marketplaces' authenticators must therefore be educated about all the different blockchain providers, and pass this knowledge on to consumers, in order to quickly discern fake items.

5. Conclusions

In this thesis, the use of blockchain to fight counterfeiting in the second-hand luxury fashion market was introduced and explained. The existing literature on the different components of the research topic was summarised – luxury, second-hand, counterfeits and blockchain, and the existing applications of the technology in the market. The interviews that were conducted with industry experts provided further insights into the topic, helping to identify uncertainty variables and map out scenarios for the future of the market.

The growth of the second-hand luxury fashion market has added an additional marketplace that lies beyond the control of luxury brands, facilitating the business of counterfeits. Online resale marketplaces specifically allow counterfeiters to sell fakes by manipulating information without prior inspection from the customer. The two main digital third-party players discussed in the literature, as well as in interviews, are The RealReal and Vestiaire Collective. Collaboration with online resale players is a judicious first step for luxury brands to take more ownership in the second-hand market, before potentially moving to more in-house resale in the future.

Hence, the importance of proving authenticity and tracking a product's history has increased, introducing blockchain as an inspiring step forward to fight counterfeiting. A digital certificate of authenticity (NFT) embedded in the tag, an upgrade compared to the traditional paper certificate, can be secured through blockchain, making it way harder for forgers to sell replicas and fool buyers. By implementing blockchain and NFTs, luxury brands could also add trust to C2C resale models working without intermediaries, reducing the need to control the luxury products listed. However, this wouldn't be a threat to the specialised workforce that can be leveraged as a new resource.

It is unlikely that counterfeiters, even if they're qualified craftsmen, can manufacture chips and connect them to the blockchain. If the product's serial number is incorrect, it won't match its digital twin. They could still create their own blockchain ledger, and take advantage of less educated consumers, representing a huge investment of time and money. However, solutions fighting counterfeiters, including blockchain, will not have much of an impact on the non-deceptive market, as this type of customers buys fakes intentionally. Moreover, brands are aware that not all counterfeit buyers constitute a loss in their own customer base, as some of them represent future primary customers. This lets us assume that blockchain would rather be

a tool to authenticate products and add trust for customers, rather than fight all types of counterfeiting.

Looking ahead to the future, an increasing number of fashion brands are set to ramp up product passport development across different B2B, B2C and C2C use cases. Players are starting to converge on some solutions, with Aura and Arianee frequently mentioned in industry discussions. Aura Blockchain Consortium, the world's first global luxury blockchain, counts as members four major luxury players: LVMH, Prada Group, Cartier, part of Richemont, and OTB Group. Aura uses a private blockchain ledger, meaning they are centralised, but can keep sensitive brand data hidden and benefit from a low energy consumption. On the other hand, Arianee is working with Richemont as an associate member, and counts Mugler, Vacheron Constantin, Breitling, Audemars Piguet and more as member brands. As a public blockchain, they offer the added value of decentralisation, making data corruption impossible. The public infrastructure is also better to support the interoperability and collaboration of different stakeholders.

This divides the market in multiple blockchain providers. Brands can decide to develop their own solution in-house, but they could also collaborate on one standard, as it was made clear that having different solutions is a waste of effort and that they will be clustering soon enough. However, experts do not see one player emerging as a market leader, rather an oligopoly of technology providers based on competing luxury groups.

In order to link a physical product to its digital twin, a lot of luxury brands have already been implementing NFC and RFID tags, but mostly for inventory control rather than customer service purposes. The problem with QR codes, NFC, or RFID chips, is that they're usually not differentiating individual products, but rather batches of products for inventory purposes. At the moment, technology is not the main focus or issue, as there are enough different options enabling to cover both brands and consumers' needs. The digital certificate can be shared to the second-hand marketplace when the owner decides to sell the product, creating an account for the second-hand buyer to give them access to the data.

It is likely that blockchain technology will end up being broadly regulated in the future, rather than regulating the power of specific players on the market. Regulators will presumably react after the implementation of blockchain and adapt to an already active market.

6. Limitations

This thesis tried to investigate and provide new insights on the use of blockchain to fight counterfeiting in the second-hand luxury market. However, some limitations were encountered during the research.

First and foremost, there is a lack of hindsight on this application of blockchain. Although there is a lot of existing literature on the blockchain trend in luxury, it often lacks details on how it could be used in practice – for instance, how to link the physical product to its digital twin. Even solution providers and luxury brands who are already actively looking into the technology are not aware of its specific mechanisms. It is also hard to tell whether brands are only stating their interest for blockchain because it is trendy, or whether they will actually invest and make it part of their business model.

Moreover, although brands have a clear interest in this innovation, it is hard to evaluate whether consumers will adopt it as well. Most luxury consumers are not aware of the technology's mechanisms and applications, and probably won't be before it is actually implemented in their purchases. However, this thesis is mostly aimed at helping brands fight counterfeiting, rather than revolutionising the customer journey. But without the participation of luxury consumers, who would transfer ownership of their items when selling them on the second-hand market, the whole point of blockchain is missed.

Finally, a relatively small response rate (16 percent) to interview requests was obtained. Some of the industry leaders were interviewed, such as Daniela Ott, Secretary General of Aura, or Graham Wetzberger, who worked as Chief Authenticator at The RealReal for six years. But it was challenging to interview any experts of the blockchain technology itself, preventing us from fully understanding the chipping of products for instance. There were no answers from Arianee executives, who would have provided valuable insights for a more thorough comparison with Aura.

7. Next steps

With these limitations in mind, some next steps could be thought of for future research.

When blockchain in luxury will be at a more advanced stage, it would be interesting to look at consumers' reaction and involvement with the solutions in place, as well as which application they value more – traceability, authenticity, storytelling from the brand, or if fully digital luxury will take over.

Secondly, while this thesis focused on the authenticity application, traceability could be investigated further with sustainability in mind. Other circular models could be looked at for luxury, such as leasing.

Blockchain could also be interesting for non-fashion luxury goods, such as cars, cosmetics, or alcohol – Aura is incidentally already including these categories in their tokenisation process. Mercedes-Benz just joined the Aura consortium as a fifth member on May 18th 2022.

Furthermore, two uncertainty variables were selected in order to provide detailed and impactful scenarios, but future researchers could look into the variables that did not make the cut. For instance, it would be interesting to analyse in further details whether a public or private blockchain would suit the market better, or how brands are going to proceed to add tags to their products.

Finally, a research project was delivered, highlighting the potential of the technology for luxury brands and second-hand marketplaces rather than giving them the actual tools to include blockchain in their business model. One could therefore think of building a practical business model for these stakeholders as a next step to this thesis.

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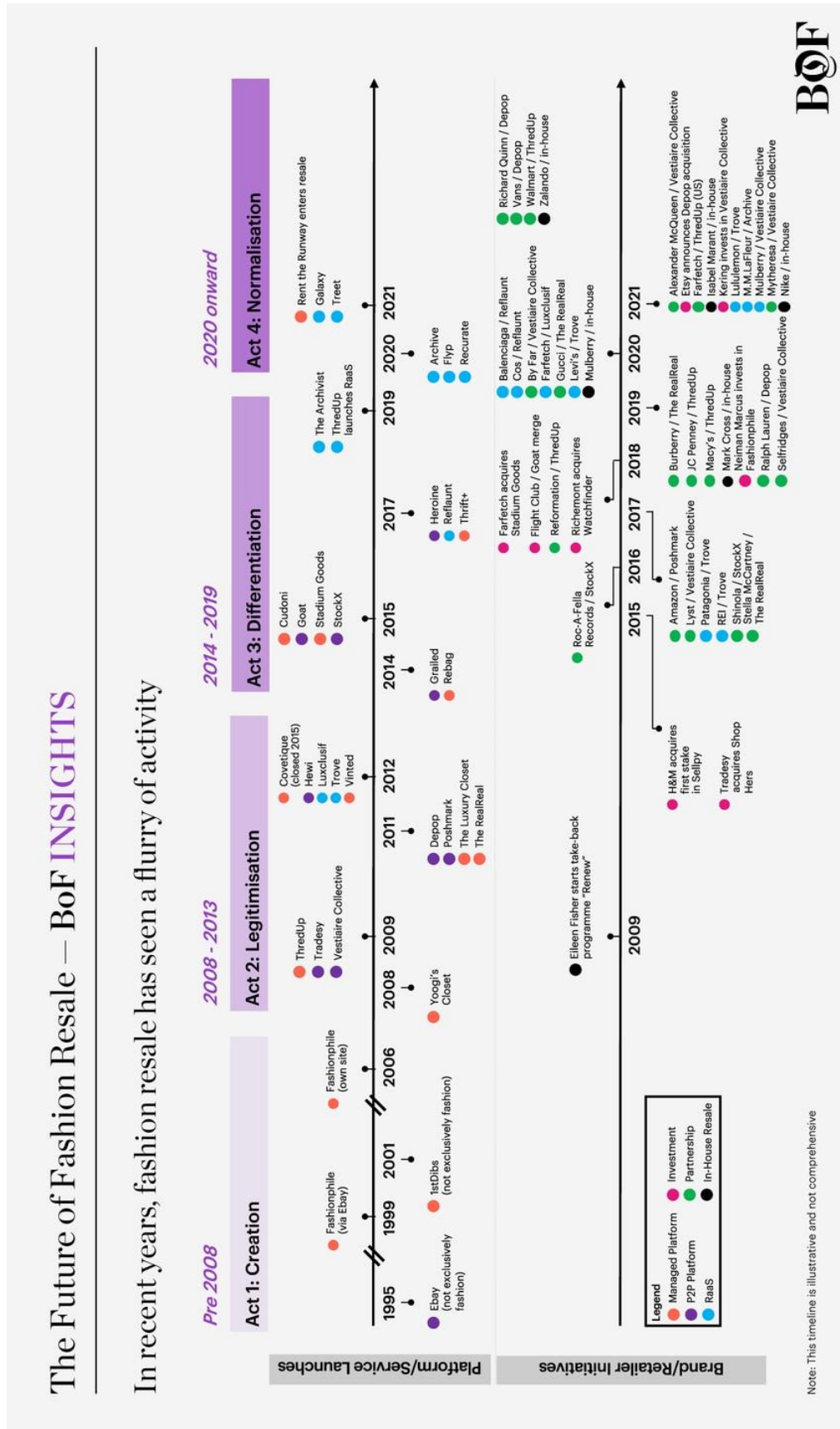
9. Appendices

9.1. Top 10 luxury goods companies by sales (2020)

FY2020 Luxury goods sales ranking	Change in ranking from FY2019	Name of company	Country of origin	FY2020 Luxury goods sales (US\$M)	FY2020 Total revenue (US\$M)	FY2020 Luxury goods sales growth*	FY2020 Net profit margin***	FY2020 Return on assets**	FY2017- 2020 Luxury goods CAGR2*
1	↔	LVMH Moët Hennessy-Louis Vuitton SE	France	33,976	50,889	-11.0%	11.1%	11.1%	6.3%
2	↔	Kering SA	France	14,930	14,930	-17.5%	16.6%	16.6%	5.7%
3	↔	The Estée Lauder Companies Inc.	United States	14,294	14,294	-3.8%	4.9%	4.9%	6.5%
4	↔	Compagnie Financière Richemont SA	Switzerland	13,183	15,821	-0.7%	6.5%	6.5%	3.6%
5	↔	L'Oréal Luxe	France	11,602	11,602	-7.6%	n/a	n/a	6.3%
6	↔	Chanel Limited	United Kingdom	10,108	10,108	-17.6%	13.7%	13.7%	1.7%
7	↔	EssilorLuxottica SA	Italy	8,793	16,445	-20.0%	1.0%	1.0%	ne
8	↑ 1	PVH Corp.	United States	8,380	9,909	3.8%	4.2%	4.2%	8.0%
9	↑ 2	Hermès International SCA	France	7,282	7,282	-7.2%	21.7%	21.7%	4.8%
10	↓ -2	Chow Tai Fook Jewelry Group Limited 周大福珠宝集团有限公司	China/ Hong Kong SAR	7,196	7,260	-14.7%	5.3%	5.3%	3.4%
Top 10				129,744	158,540	-10.3%	9.4%	4.3%	5.4%
Top 100				252,270	292,775	-12.2%	5.1%	2.8%	1.8%
Top 10 share of Top 100				51.4%	54.2%		104.0% ³		

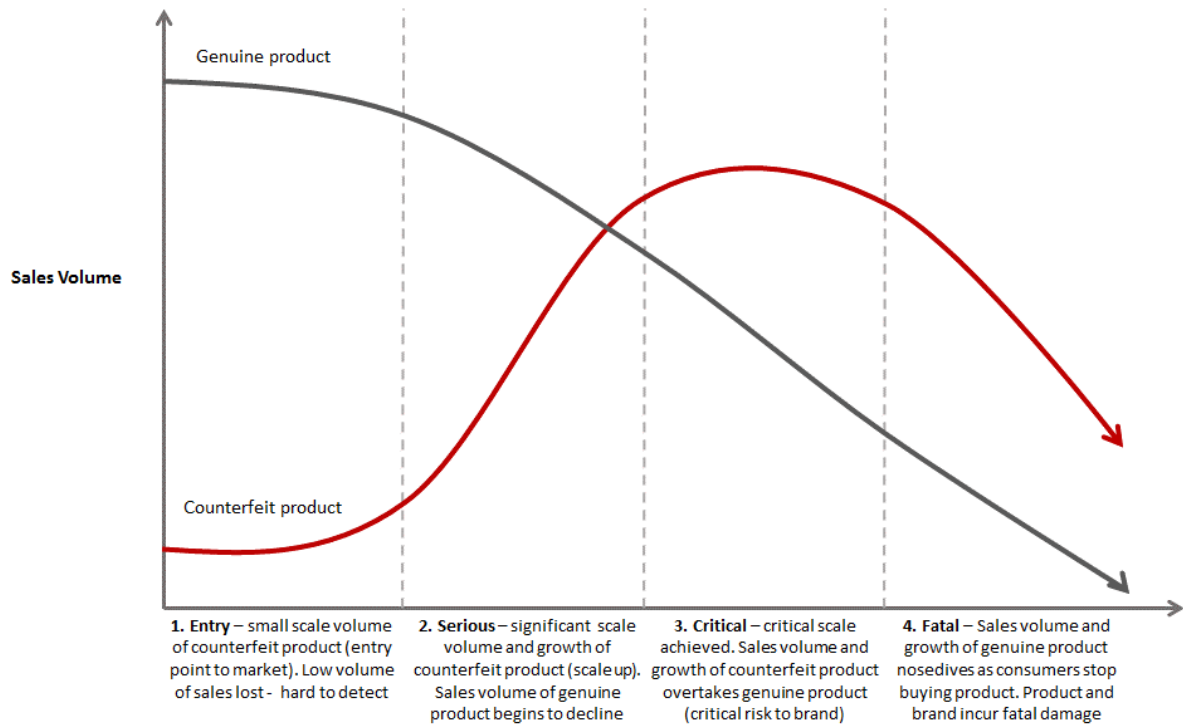
Source: Deloitte (2020)

9.2. Evolution of digital fashion resale marketplaces



Source: The Business of Fashion (2021)

9.3. Lifecycle of luxury sales volumes after counterfeiting



Source: Maaz & Ali (2020)

9.4. Interview questionnaire

Intro

The objective of this interview is to understand how blockchain could help fight counterfeiting in the luxury second-hand market. Thanks to the data you will give us about the industry and the technology, we will be able to establish our analysis.

- Could you introduce yourself?
- Could you introduce your career, experience?
 - a. How did you end up working in blockchain/luxury?

Blockchain

- What do you know about blockchain in the luxury industry?
 - a. Supply chain?
 - b. After sale services (to fight counterfeiting, authenticate for repairs)?
- How to create the digital twin?
 - a. QR code? NFC? RFID tag?
 - b. Multi-proof system?
 - c. Is there a possibility to still copy that physical code?
 - d. Unique code for each item? Production efficient?
- How to access the blockchain? Private or public blockchain?
 - a. Give an access to second-hand market players?
 - b. Via an app?
 - c. Through the store?
- Use of smart contracts? For example, when a product is sold, is the transaction directly added to the blockchain?
 - a. If not, manually by the seller?
- Permissioned blockchain? Still decentralised?
 - a. Advantages/limitations of permissioned/permissionless
- Would it be possible to include collector items in a product passport if they're decades/centuries old? If a luxury brand implements blockchain, would they only start with their new items? (Then second-hand luxury with blockchain can only be applicable after these new items have been used, so we're looking to the long-term horizon)

Luxury

- What are the current techniques/systems to fight counterfeiting?
 - a. Do brands offer their own authentication services? Why/why not?
- Better to work with competitors or independently?
- Where and how do you choose the suppliers? What about the grey market?
 - a. Offshoring? Benefits/limitations?
- Is the second-hand market a threat to luxury brands? Will luxury brands adapt and sell second-hand products as well?
- Will luxury companies take over the second-hand market?
- Would it make sense to include collector items in a product passport if they're decades/centuries old? If a luxury brand implements blockchain, would they only start with their new items? (Then second-hand luxury with blockchain can only be applicable after these new items have been used, so we're looking at a long-term horizon)

Second-hand

- How do you authenticate luxury items?
 - a. Contact with luxury companies
 - b. Third parties, experts
- Would blockchain benefit the second-hand market?
 - a. Add trust, reduce costs?
 - b. Or kill the middleman? Luxury companies taking over?
- What issues did you encounter with counterfeiting as a second-hand reseller?
 - a. Profit made by counterfeiting? Blockchain could make you lose money?

Regulation

- How do you regulate counterfeiting today?
- How would you regulate blockchain?
 - a. When?
 - b. LVMH monopoly? (Aura)
- What do you think about this innovation?
- Similar cases of innovations being regulated?

9.5. List of industry experts contacted for interviews

Name	Company	Role	Relevance	Category	Answer	Accepted
Hervé Bonazzi	Archipels	CEO	Specialised in digital identity	Regulation	X	X
Mathieu Pollet	EURACTIV	Journalist	Wrote articles about blockchain regulations	Regulation	V	X
Paul Maier	EU Observatory on infringements of intellectual property rights	Director	Specialised in intellectual property	Regulation	X	X
Jimmie Franklin	VIXIO PaymentsCompliance	Reporter	Expertise in EU/UK financial and tech regulation	Regulation	X	X
Julia Chinakaeva	SLEEVE	VP of Marketing	Research Director - Blockchain in Fashion for BQ Intel	Blockchain in luxury fashion	V	V
Lorien Alecki	Accenture	Strategy Consultant Manager	Conducted research on blockchain in fashion	Blockchain in luxury fashion	V	X
Maghan McDowell	Vogue Business	Senior Innovation Editor	Writes about blockchain in luxury for Vogue Business	Blockchain in luxury fashion	X	X
Angela Cearns	TrueTwins	CEO	Develops a digital passport platform for luxury brands	Blockchain in luxury fashion	V	V
Julien Romanetto	Arianee	Co-founder	Arianee is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Pierre Nicolas Hurstel	Arianee	CEO & Co-founder	Arianee is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Stéphanie Bretonnière	ORIGYN	CEO	ORIGYN is a decentralized community for the luxury market on the blockchain	Blockchain in luxury fashion	V	X
Gautier Pigasse	LVMH	Head of Innovation & Blockchain	Aura is one of the leaders in luxury blockchain & LVMH is the luxury leader	Blockchain in luxury fashion	V	X
David Teruzzi	Aura Blockchain Consortium	CTO	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Gildas Vinsot	Aura Blockchain Consortium	IT Architect	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Sébastien Taupin	Aura Blockchain Consortium	Business Development and Partnership Manager	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Daniela Ott	Aura Blockchain Consortium	Secretary General	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	V	V
Stefano Rosso	Aura Blockchain Consortium	Board Member	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Cristiano Busetto	Aura Blockchain Consortium	Off-Price Sales Manager	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Jean Dellière	Aura Blockchain Consortium	Innovation Intern	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Angela Au-Yeung	Cartier	International Innovation Director	Board member of Aura Blockchain Consortium	Blockchain in luxury fashion	X	X
Eric de Rocquigny	Van Cleef & Arpels	COO	Board member of Aura Blockchain Consortium	Blockchain in luxury fashion	X	X

Kristina Bokova	Aura Blockchain Consortium	Customer Journey Lead	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	X	X
Franck Le Moal	Aura Blockchain Consortium	Board Member	CIO of LVMH	Blockchain in luxury fashion	X	X
Thina Andersson	Aura Blockchain Consortium	Business Development Intern	Aura is one of the leaders in luxury blockchain	Blockchain in luxury fashion	V	X
Emma-Jane Tritton	Richemont	Lead Counsel, Anti-Counterfeiting & Brand Protection	Fight against counterfeiting	Luxury fashion	X	X
Audrey Vachet	Chanel	Business Controller Retail	Internal control policies	Luxury fashion	X	X
Anonymous informant	LVMH	Corporate Affairs	Luxury company	Luxury fashion	V	V
Charles-Henri Levaillant	Louis Vuitton	Development director	Luxury company	Luxury fashion	X	X
Claudia d'Arpizio	Bain	Senior Partner	Specialist on luxury industry	Luxury fashion	X	X
Adélaïde Leblanc-Zanellato	Vestiaire Collective	Authentication Curator	Luxury second-hand marketplace	Second-hand luxury	X	X
Milda Jasaite	Vinted	M&A Director	Peer-to-peer second-hand marketplace	Second-hand luxury	X	X
Lauren Mrozowski	The RealReal	Luxury Manager	Luxury second-hand marketplace	Second-hand luxury	X	X
Nora Raspanti	The RealReal	Associate Luxury Manager	Luxury second-hand marketplace	Second-hand luxury	X	X
Vicky Van Asbroeck	Vestiaire Collective	Chief Experience Officer	Luxury second-hand marketplace	Second-hand luxury	X	X
Gintarė Bogucevičiūtė	Vinted	Director of Content Quality	Peer-to-peer second-hand marketplace	Second-hand luxury	X	X
Nina H	Vestiaire Collective	Fashion and Luxury Specialist	Luxury second-hand marketplace	Second-hand luxury	V	X
Melissa Boels	OZER concept	Founder	Luxury second-hand shop	Second-hand luxury	V	X
Graham Wetzberger	Luxury Appraisals & Authentication	Founder & CEO	Luxury authenticator	Second-hand luxury	V	V
Kshitij Kumar	Farfetch	Chief Data Officer	Luxury second-hand marketplace	Second-hand luxury	X	X
Stephanie Crespín	Reflaunt	Founder & CEO	Luxury second-hand marketplace	Second-hand luxury	V	X
Victoire Boyer Chammard	Vestiaire Collective	Head of Authentication / Luxury Expert	Luxury second-hand marketplace	Second-hand luxury	X	X
Alba Figueras De La Parte	Her-Age	Co-Founder & COO	Luxury second-hand marketplace using blockchain	Blockchain in second-hand luxury	V	V
Ataman Ersan	Her-Age	Co-Founder & CMO	Luxury second-hand marketplace using blockchain	Blockchain in second-hand luxury	V	V
Dominique Henneon	Test-Achats	Director Information and Services	Consumer point of view	Consumer protection	V	X

9.6. Variables prioritisation table

Variable	Impact on				
	Blockchain	Brands	Second-hand players	Consumers	Counterfeiters
Brands developing in-house second-hand service versus brands collaborating with existing resale players	Low: whether in-house or collaboration, blockchain will most likely be integrated	High: impacts brand's revenue, reputation, and ownership	High: impacts revenue and entire business model	Medium: impacts the marketplace(s) the second-hand buyer will shop on	Medium: impacts the process of authentication and therefore the risk for counterfeiters to get caught
Blockchain providers competition versus collaboration	High: impacts technology and level of knowledge	High: impacts competitive advantage and use of blockchain	Medium: impacts APIs between second-hand players and blockchain providers	Medium: impacts accessibility of product passport interface	High: impacts the workload of counterfeiters copying the technology
Public versus private blockchain	High: impacts their business model	High: impacts the handling of their data	Medium: impacts the handling of their data	Medium: impacts consumers' trust level and the handling of their data	Medium: impacts counterfeiters' ability to access the blockchain
Counterfeiters having skills to copy the technology versus staying behind	High: impacts usefulness of technology to fight counterfeiting	High: impacts revenue and reputation	High: impacts trustiness and intermediary control	High: impacts trust and brand loyalty	High: impacts number of counterfeited items

9.7. Transcripts of interviews

9.7.1. Interview with Anonymous Informant (Corporate Affairs Managers at LVMH)

Juliette Herinckx: Hi and thank you so much for making the time for this interview. Can you please start by introducing yourself? What do you do for a living?

Interviewee: Sure, so my name is X. I work for LVMH, I work in the corporate department that's based in Brussels. And my job is to anticipate and influence legislations that are the best for the group.

Juliette Herinckx: OK, and how did you end up working in the industry?

Interviewee: Uhm, about 10 years ago, when I saw an ad for an internship at LVMH. They were looking for somebody who either had a European studies background or European law background, somebody who was speaking French and English. And, uh, yeah, I just went to the interview, I got the internship and I stayed there! The person I was working for left the company after six months, so I took over that job and then... from there to there!

Juliette Herinckx: Thanks! So, we have some categories to go through. Maybe starting with blockchain in general. Do you know about the technology? What do you know about it?

Interviewee: I know about the technology; I know what I've read about it. I know there is a lot to say about it. I've read a couple of books about it because I was intrigued at the very beginning about the whole ecosystem and what the applications for obviously our sector would be, because it was kind of the first thing since the Internet where people said it would revolutionise the world and how people are doing business and how people have interactions etc. And then, well, whether that's going to happen is still debatable.

Juliette Herinckx: So maybe more specifically about blockchain in luxury. Do you know about the different opportunities there are? What do you think of them?

Interviewee: Well, there's a lot of potential applications for the luxury sector of blockchain. Some of them have been a bit exaggerated I would say in my humble opinion and within the limits of my knowledge on blockchain. Basically, to me it seems that the entire added value of blockchain is to have something that's decentralised right? When blockchain is no longer decentralised, you basically have a glorified database, which is interesting, because it's a bit decentralised in the sense that it's out there and it's more difficult to modify, etc, but it's not really blockchain as it was intentionally created, but then again, you know the Internet that we

have today is probably not what we had in mind either. So the applications for the luxury sector, there are two of them I would say, the first one is related to value chains and traceability and ultimately I would say storytelling for consumers because we can create some kind of blockchain for every product, or you can say I don't know, this bag has been made with leather from this cow and it's been stitched by Mrs X on this date and then it's been sold in the New York shop on this day. And then even once we've reached the second-hand market, which is, you know, not something that we have now at the moment, but even for the second-hand market there's potential applications of the bag that you're seeing today. I have the digital passport or something in the blockchain of the product and I know that it's been owned by Juliette from 2004 through 2016 and then she sold it to Rosalie, so I know how many people have owned the product. And I still know where the product is coming from, so there the applications for that are extremely interesting, especially when you have increasing transparency requirements both from legislators and from consumers. I would see the potential in that. The second application, which is a bit less straightforward to me, is the fight against counterfeiting. And more specifically, the authentication of products. I like to talk about authentication of products more than fight against counterfeiting because basically all you can say when you have blockchain is, well this is an authentic product, but the thing is that when you're moving, when you're talking about fast moving consumer goods, it's easier to apply blockchain because the good is there, you consume it and then it's not there. When we're talking about products like I don't know, a Louis Vuitton or Dior bag, for example, that you're eventually going to keep for thirty, forty, fifty years maybe, well, it's much more difficult to say because you can only say... If a client comes to you and says, "is this a real product?", you can only tell the person if the product has been produced after the date when we started using the blockchain, right? Let's say if you start using the blockchain in 2019. If a customer comes to your shop and wants to authenticate a product that dates back to 2017, you're not going to be able to use that technology. It doesn't mean that the product is fake, it just means that you don't know, you cannot tell, or you will use another method to authenticate the product. But in the end, in the long term, if that's a technology that is going to last, it will be much easier to authenticate the product.

Juliette Herinckx: Maybe on that authentication side, how do you think they would implement that? So would each product have like a QR code attached to it, to give it a unique identity? Do you think brands would be willing to do that?

Interviewee: Well, it's not a QR code, it's really just an entry in the blockchain. I don't know how it works, you know exactly, technically, but it's just really an entry in the blockchain. It's a block in the chain that is there, and that is immutable, that you cannot change unless you have the key. So that's really how it works. Then in the end, obviously you have to translate that blockchain into something that's readable to the end customer. So obviously if you would have a QR code on the product or on the product packaging, and then you scan it with your computer, you're not going to have access to the blockchain in itself, you're going to have access to what I would assume is an interpretation of the blockchain, right? Again, saying this product has been made with the leather from this region in the world and stitched together by Marie Françoise, who's been working in the atelier for 25 years and you could see a picture of her. There's a lot of potential different applications, but that's it. But the customer is not going to see the chain in the raw sense of it, he's going to see an interpretation of the chain for the purposes of telling the story to the end customer.

Rosalie Ghislain: If I can jump on that, maybe it would give an access to a platform which would give information about the blockchain to the customer?

Interviewee: Yeah, it could end up like somewhere on the brand's website or something like that.

Rosalie Ghislain: Sure. And do you know anything then about Aura, the new blockchain platform launched by LVMH and a lot of other companies? If so, could you explain how it works?

Interviewee: Well, I'm certainly not the best placed person to talk about it, because it's really not my area of expertise. I know that it is something that has been created by a consortium of brands including brands from LVMH, but it is meant to be something that is kind of outside, it's not part of LVMH, LVMH was just one of the founding members of the consortium. It's currently being built and developed, and the objective of the consortium is to identify the potential applications of blockchain in the luxury sector with a number of companies. So, the idea is to develop let's say dedicated solutions companies would be interested in. If you want, I know one of the guys who created it.

Juliette Herinckx: That would be nice!

Rosalie Ghislain: Do you know if the main goal of Aura would be more supply chain based or is it also for authentication? Because you just said that authentication is more complicated.

Interviewee: Well, I think it's really... well again, he will tell you much better than I will, but it's really meant as a lab for all the possibilities that could be applicable to luxury. And it's a fairly early stage of development. But the idea is just to create a group of interested companies who are willing to test and learn and see how they could apply blockchain, they're there to help develop a tailor-made technology for the companies to use. Because everybody is going to want to have their own solution and everybody is going to have their own way of showing it to the client, so I think that's what Aura is there for.

Juliette Herinckx: Maybe NFTs as well via Aura, right?

Interviewee: Uh, maybe probably. I couldn't say that this is, you know... I know even less about NFTs that I know about blockchain, I wish I could tell you more about it. Obviously, it's a bit like blockchain a few years ago, there's a lot of potential applications for the luxury sector in the Metaverse with NFTs etc. There's going to be a number of people who are going to test it, who are going to be "the first".

Rosalie Ghislain: OK. Let's maybe move on to the luxury part of the interview. What are the current techniques used to fight counterfeiting of luxury fashion goods?

Interviewee: There are many. So, do you mean about the technology or the ways that we fight counterfeiting?

Juliette Herinckx: The ways that you fight counterfeiting. Could be technologies!

Interviewee: I'm trying to think where to start. Maybe the starting point to explain is that basically 85 percent of counterfeiting is produced in the same country, you probably know which one. The problem with that is that it's very difficult for us to influence the production aspect of counterfeiting because in the few cases where we manage to have authorities collaborate and that we manage to close those factories, just two weeks later, there's just another factory that's even better, bigger, and faster. So basically, what is left to do is work on the distribution side, so make sure that, first of all, people are not looking for counterfeiting, are not exposed to it. And second of all, try to make sure that people who are actively looking for counterfeit products have a hard time finding it. This is just minimisation of risk. Because anybody who's going to look for counterfeiting, they're always going to find it. The most important aspect for us is consumer protection from the health and safety point of view, when we're talking about fake cosmetics, perfumes, champagne etc. So, when you're talking about those kinds of products, the consumer protection aspect is very straightforward, right? You

take the product, you put it on your skin, you drink the champagne. So that is pretty straightforward, what risks to your health that can bring. And then besides that the indirect risks to your health, that can come from other types of products for example, from having too much lead in a fake watch or in a fake piece of jewellery, or from having very dangerous chemicals in fake bags etc. So, the other aspect of that is also to avoid that when people are shopping on the Internet, they end up buying a fake product that they thought was authentic. Because what happened with the Internet is that it gave the possibility to counterfeits who were selling their products for 100 EUR on the streets of Barcelona to basically take a picture, make it look like a real product, and sell it for 1200 EUR instead of 100 EUR. And the problem with that is that when a person who buys a 100 EUR fake bag on the streets of Barcelona, they had no intention of ever buying the real product right? The person who's spending 1200 EUR instead of 1500, they just think they got a good deal with their product. And the reaction to that is they will never buy from our brands again, instead of never buying from eBay or from this Facebook page or Instagram account or something like that. So that is really the main evolution of the fight against counterfeiting, we've kind of moved from the brand protection aspect to a consumer protection aspect, meaning protecting the consumer's health, but also trying to avoid losing potential customers. Then, what do we do to fight counterfeiting, well based on the information that we have about the places where the goods are made, we try to intercept part of the shipments when they arrive in European countries. Obviously, we use our own resources, but also private investigators whose job is to find these counterfeited shipments. When we're in the digital space, it's much more difficult because products are not shipped by thousands at the time, they're shipped 1 by 1. So, there it's very difficult so we're working hard with also what we call online intermediaries so all the people who are standing between the counterfeiter and the final customer, whether it's the search engine, whether it's the domain name registrar, whether it's the social media, whether it's the marketplace, whether it's the live streaming video or something. Or sometimes all of the above, because it's not really linear anymore that you go to one base, you reach a website, you buy a product etc. Usually, you open your Facebook or your Instagram page or your TikTok and see something and you end up on somebody's page and then end up on a website and the way of buying the product is more than just one thing. But we're trying to make sure that all those people who are between the counterfeiter and the final consumer take a bit more responsibility for fighting counterfeiting and make sure that, as I said, people who are actively looking for counterfeit products do not find them too easily, meaning if you type "fake Louis Vuitton" or "Luis Vuitton replica" in the Google, Facebook or Instagram surf bar, you don't have any fake products coming up.

Rosalie Ghislain: These people who purposely buy fakes, can we say they're not directly your customers, because they would never have bought a real Louis Vuitton bag for example? Do you still care about their health if they're not considered your customers?

Interviewee: It doesn't matter. First of all, we care about everybody's health and safety. Whether or not they are customers. Uhm, as I said, obviously we have to prioritise how we fight counterfeiting and so our objective by limiting the visibility is that we're going to try to make it more difficult for those people to be exposed to the products. And then again you never know who's going to be your customer. Maybe somebody who's really into fashion when they're 14-15 they just now see a fake product, and they're like "OK, I don't really want to buy a fake product, I really like the original, but I have to start with that". Maybe that person who's 14-15 now, when she's 30, she's going to save money to buy her first luxury bag or something like that and then once she's 35 she's going to save again for her first luxury watch, I don't know. You can never tell that whether people are going to be clients or not, so you have to act as if they're potential clients.

Rosalie Ghislain: That's really interesting because in the literature they are not talking about it this way. They're really splitting those two types of consumers. So, it's really helpful to have your insights!

Juliette Herinckx: Do you think consumers who buy fakes which are just as expensive as the real ones aren't aware of those being fakes? Are they shopping on specific marketplaces? Or what kind of places do you find these fakes in?

Interviewee: I would say everywhere. I think, you know, it can come from social media pages, for example, go on Facebook and you like the page of a luxury brand but then one person comes to you from the same group and says, "I have one of these products for you, here's some pictures of it, if you're interested in buying some." And then you end up buying it because you think that person is genuinely... well first of all you have the same interests, and then you see that it's a real person selling you a product, sometimes you don't realise the product is fake. So that can happen via targeted advertising as well. You know, when you scroll on Instagram, every fifth post that you see is a sponsored post, and it's not very clear that it's a sponsored post, sometimes it integrates pretty well into your own feed. I think it's 20 percent of all sponsored content related to fashion on Instagram that's actually fake products. It's not nothing, I mean there's a lot of people who are less sensitised, aware of that. Obviously with COVID-19 also especially, there's a lot of people who would normally not buy online, have been forced to buy

online as well, so those people were much more vulnerable when conducting their first or one of their first purchases online. So obviously they were exposing themselves to some kind of... to being scammed into buying fake products or being deceived or... It's not just fakes, it's also buying things that never arrive or something like that. All those types of scams you can find online. It can be everywhere, it can be on TikTok, you see a video of something and then you see a WhatsApp number, you send a message and then they're talking to you directly, giving you the impression that you're buying from a real seller or something like that. So, there's a lot of ways to buy fake products and all the advantages of e-commerce are also the disadvantages when it comes to the fight against the counterfeiting, because you have people who are very anonymised online. There is an impression of an identity, but you don't know what's behind that identity and people cannot see the product, they cannot feel it, they cannot touch it, they cannot see the person who's trying to sell that product, which is, you know, very different to somebody stopping you in the streets of Paris, Madrid, or whatever.

Juliette Herinckx: And if someone buys a fake and doesn't know if it's a fake, can they go to LVMH to get their item authenticated? Do you have specific services for that, or is it third parties usually?

Interviewee: Well, uhm. It's a good question. The long story... well, it depends from one brand to another, it depends from whether that person is already a customer or not. Uh, also there's been a lot of abuses lately with that because of the rise of the second-hand market. People come with a bag in the shops, trying to get the bag authenticated, even with the potential client in the shop, but they end up having a transaction in the shop without it even being one of our products. There's been a lot of abuses, but the short answer is that if somebody buys a fake version of our products, there's nothing that we can do. Even if we accept to authenticate the product, once we tell the person it's a fake, we're not going to reimburse them for buying a fake product. It's not our responsibility, right? And that's also one of the problems because in a lot of situations, people blame the brand. So, the reaction is "I'm never going to buy it from Fendi again", or "I'm never going to buy from Saint Laurent again" or something like that, and not "I'm never going to buy from Facebook or eBay again".

Juliette Herinckx: Do you think brands, or maybe luxury companies, should collaborate on the fight against counterfeiting?

Interviewee: They do, they do already. Meaning... it's not like they have the same provider that's fighting counterfeiting for all of the brands etc, but they are members of the same trade

associations sometimes, we're also pushing in the same direction. Sometimes they employ the same people to strengthen the fight against counterfeiting or something like that. When you seize products, it's really rare that it's just one brand, right? So, if you open the container for example in the port and you see that there is Louis Vuitton, but also Gucci, Chanel or whatever, usually it's the customs that will call the individual brands to let them know that these are their products out there. It's a small world so people can know each other and help each other out, get in touch with customs or something like that.

Juliette Herinckx: Do you think there could be a fault in the supply chain where your own suppliers contribute to producing fakes?

Interviewee: So, it can happen but with us not. Well, let's say the risks are very limited for two reasons. First of all, we produce in Europe, and you know when there's breaches in supply chain they usually apply outside of Europe, certainly China, Southeast Asia, etc. This is where it's most likely to happen. Typically, Zara produces something in China, they order 1,000,000 and then they produce 1,300,000, remove the Zara stickers and you end up having the exact same product being sold to other retailers. So, this obviously happens, the risk is less in luxury sector, as I said, first of all we don't produce outside of Europe (at least for LVMH) and also our production is integrated or is very limited. Usually, our products are made by our own employees in our own factory and obviously that limits to a maximum the risk of having a breach in that. I know there's been a lot of initiatives on securing the supply chains etc, obviously a lot of development for bigger, mass market brands where they don't control the production of the products as well as we would in general. But for us it's less random.

Rosalie Ghislain: Can you explain the point of view of luxury brands towards the second-hand market? Do you think it's a good thing for luxury or not? Do you think luxury brands might take over second-hand, have their own second-hand services in the future?

Interviewee: I mean, I think... Obviously second-hand luxury is a great thing, because it comes from what we are selling, which is high quality products that can be passed on from one person to another. The question is how and where they're being sold and to whom, obviously because we were talking about counterfeiting just before and it's very easy also to make a counterfeit product look like a second-hand product or something like that. So, there's obviously also a risk there. But in general, I think that second-hand trade of authentic products is just a normal consequence of the fact that we're selling high quality products and that you know people are also seeing our products as investments and they're consuming our products, and then once

they want another one, they know that what they have in their hands is still going to have value. And it's also a way to promote sustainability in general and doing good. And then the second question, do we think that we're going to control this market? This is just my personal opinion, but I think it's already too late for that. There are very established second-hand players and I think that's our sector missed the train on that a couple years ago. So, unless obviously there are some big acquisitions, meaning buying one of these players, I'm not sure of the potential for brands to just create another second-hand platform.

Juliette Herinckx: You could offer second-hand in store for example, if clients return their olds items to a Louis Vuitton store?

Interviewee: Well, certain brands do it already, yeah? They give you a possibility of repairing or renewing a product that you already have, or to re-personalise it, or even to transform it for some types of products. For example, I was just talking the other day with somebody within our brands in the jewellery sector and they were explaining that sometimes, when the product is broken because of time or something, and that there is really nothing we can do to repair it, we can actually take the gold from the product, melt it, and redo another product from that gold. Because, you know, gold is just a raw material that you can use and reuse indefinitely. So, it's something that we do already to a certain extent. Now is there going to be within the same shop new products and a second-hand products section, I don't think so, or at least not tomorrow. Do we want to ask about regulations now or?

Rosalie Ghislain: Let's maybe go over to our regulations section. How is counterfeiting in the luxury industry regulated today? Is it regulated by the E.U. or by luxury brands?

Interviewee: It's regulated at E.U. level, there's a number of different legislative tools, but the larger framework is mostly at European level and then Member States have also adopted their own versions of that legislation. And for some of them, but a very limited number of them, they have done a bit further than what the E.U. requires.

Juliette Herinckx: And do you think if a blockchain platform like Aura becomes mainstream, it would be regulated? How so?

Interviewee: It's likely that blockchain, like AI and other technologies are going to be regulated one day, I don't think it's going to be regulated in the very details of what you can do, what you cannot do, but I think there's going to be some... It's a broader principle that we're going to have to apply when you're developing the supply chain.

Juliette Herinckx: For example, making all the brands join a single platform, could that be regulated? As in preventing each brand to have a different platform or?

Interviewee: So, you mean legally forcing brands... legally creating monopolies?

Juliette Herinckx: More like preventing a monopoly, for example, like preventing LVMH from...

Interviewee: If you're forcing all the brands to join a platform, you're creating a monopoly, not preventing it. But yes and no, I mean legislation is there to build the principles and competition law is also there to enforce them and make sure that there's sufficient competition. But when you look at the tech sector, and especially the GAFA for example, in general you can see that we haven't, or neither has the US, haven't been really good at preventing monopolies from happening. But in the end, social network effects are so big, it's very difficult, but I think when it comes to blockchain, we're at the stage where it's still early enough. There isn't one big actor that has emerged out there.

Juliette Herinckx: Time will tell, I guess! Maybe a conclusion question, do you have any more opinions on the technology? Do you think it's feasible? When would you think it would take over?

Interviewee: That's going to be again my personal point of view and so yes, I think there are useful applications as I said. I think that the initial spirit behind the blockchain of having something that was decentralised and that grants you independence from the traditional institution isn't really there anymore, because you don't really have any decentralised blockchain anymore already today. And if you look at the biggest applications, luxury is maybe not the best one, but look at the finance sector for example. Because the blockchain was originally something that they wanted to apply, or where the initial applications were mostly in the finance sector and insurance sectors etc. If you look at what's happened in the finance sector where the big banks have seen potential competition. And they've all created their own blockchain initiatives, sometimes together, in the end there isn't any non-bank controlled blockchain initiative. And the added value of having that, what's the difference of going by blockchain versus having just another kind of database? Unless that if you lose your key... 'cause that's also one of the disadvantages with the blockchain is that there's only one person that has the key, and if they lose the key well what do you do? Your product doesn't exist anymore, you don't have any proof that it does. But as I said, it's still the very early stages, I'm sure there's going to be solutions to those problems.

Juliette Herinckx: And do you think there is also a demand from the consumer for this type of platform with information about the product?

Interviewee: I think for our products when it comes to the luxury sector, there's definitely a demand both from the customers and an opportunity for the brands to start telling more and to be more transparent about the products.

Rosalie Ghislain: I had a little question to go back to about second-hand, when you mentioned it was only positive for luxury brands. What we noticed in the literature is that maybe sometimes luxury can have a different point of view; when having that value of wanting to be unique and exclusive, it could hurt their image if some of their non-customers would still own their products?

Interviewee: I personally think that it's... I wouldn't say stupid, but I don't think that it's a good depiction of reality, I think that this is 2022, it's the age of sustainability, circularity, etc. You can no longer just act like second-hand is not a thing and like this is not... You're either going to look at it as an opportunity or as an obstacle, but in the end basically second-hand is also just an opportunity to reach to the younger generations who don't necessarily have enough money to buy the real one. But it's better that they buy a second-hand one than they buy a fake one. So maybe this is also what could be interesting for a few brands, to better control or at least be more involved in the second-hand market, it's a way to open the door to your brand for younger generations who don't have the means to buy our products at this age. And you know, once they've bought the perfume, once they've bought the card holder or the pair of sunglasses, or any of the more entrance level products, they cannot necessarily straight away buy the 3000 EUR bags, so they go for second-hand. Even if they can afford it, they can have a mix of new and second-hand, because of their values also eventually that they don't want to buy only new products. So, I think it's an old view to think that people think that luxury brands would oppose to the second-hand market. Maybe the initial position on that was that brands were frustrated to be missing out on a financial opportunity to sell their products for a second time, but I think people are changing or will have to change their mind on this, because I don't think it's going anywhere.

Rosalie Ghislain: OK, great, thank you! I think we could talk for hours about that subject so it's very interesting.

Interviewee: Yes! Thank you.

9.7.2. Interview with Julia Chinakaeva (Research Director at BQ Intel)

Juliette Herinckx: Could you maybe start by introducing yourself, your background in blockchain & fashion? What research did you conduct about the technology?

Julia Chinakaeva: Of course. Actually, my journey had a couple of U-turns there. I started in oil and gas back in Russia in management consulting. I started working at Schlumberger, I don't know if you guys heard about it, it's kind of like top three, probably still number one, but top three oil services company. I proceeded with oil and gas in Canada when I moved here, and at a certain point I was looking for kind of my next passion, my next fascination. Especially being in Canada, I think we're tired of oil and gas. I started researching other industries and I started thinking about fashion because my grandmother was a seamstress, and it was always something that... I guess not probably girls in general, but I guess for me in particular, I looked at her creating garments from just like flat pieces of fabric and I was thinking how is it even possible? Honestly, it's much harder than we realise there is a lot of tag documentation, there is quite a bit of geometry involved there, it's much more complex than we think to sew a garment that would fit someone perfectly. Then I started researching what is happening in fashion and then in 2018 I came across the most terrible parts of it, and I think I was filled with disgust for myself, because I contributed to the problem, not really knowing, researching, or realising any of the consequences. And I, I think since then I kind of embarked on a journey of looking, researching solutions in the industry that could, if not completely change it, but at least... as people during the Vogue Business conference said, bringing the technology solutions that could bring in that positive to the industry. And at the same time, uhm, this blockchain intelligence start-up contacted me for an employment and I agreed. And then they also asked me what I wanted to do, is there a deep dive in terms of analytics and data that I wanted to take, and I said that I would love to analyse and understand the use cases of blockchain within the fashion industry and this is pretty much how the idea of research was born. I know I started way back, but I also think that people journeys are interesting to look at because they explain so many choices for individual and maybe also on the societal level. After the blockchain in fashion report, I brought this idea to Insead with me, and I had a very interesting panel called blockchain and passion. We had people from Arianee, Consensus, LVMH, Cartier. So basically, the technology providers and technology consumers. I should send you a link to the podcast.

Juliette Herinckx: Yes, I think I came across the podcast, I was planning on listening to it.

Julia Chinakaeva: I will tell my team that it is further utilised and I'm very happy that people found it and people are listening to it because I think it was great to hear from the industry experts on the topic. I'm not working in particular on blockchain as of now, I work for another start-up, also founded by an Insead'er. It goes probably a little bit even deeper than blockchain in terms of bringing sustainability to fashion, it proposes on demand solutions, which is manufacturing clothes on demand and what we want to do actually is to have blockchain as a next step for those on demand operations, so that everything is connected and stored on blockchain. Yeah, I guess this is my journey.

Juliette Herinckx: Interesting, thank you! So maybe more of a deep dive into blockchain, what do you think about blockchain in the luxury industry? What are the different opportunities you identified? Which one is the most interesting according to you?

Julia Chinakaeva: I think I'll stick to what I found out during my research. Well, first of all, I think that it holds incredible opportunities. I don't think we still understand what we can do with blockchain. I think someone said, and I very much like this analogy, that blockchain is like people discovering fire in the beginning, but they had no idea how it actually completely changed the society. So, I think we're still at the discovery stage of the fire. We're maybe having, I don't know, we're gathering together, cooking food on it, but we don't know about industrial revolution, we don't know about all the other consequences and steps of the technology. The major use cases I researched were anywhere from... So most of them were in transparency and authentication, and in my understanding, they could be obviously combined, but it's a more complex and a more expensive exercise and there is a clear distinction between a very high-end brand, who values the genuine aspect of their product, so they mostly deploy blockchain for those reasons, so that people who buy their items anywhere in the world can scan the chip and they would have a digital certificate that proves the authenticity of the product. It's pretty much what is now called NFT, before it was not called that, but yeah, what is basically done is the non-fungible token is created and linked to every physical manufactured item. It could go deeper, you can trace supply chain, and something that I call traceability I think is more interesting for maybe slightly lower end brands because people who buy there are usually... it's a different kind of customer, based on my research. They might be younger, they might be more environment cautious, and they want to know that what they're buying does not contribute to the, at least not as much, that it all does not contribute to the pollution and most importantly unethical practices. So, uhm, you can also trace the supply chain in some of the use cases. But in my research, it was harder to do, especially because... brands that are

slightly lower end are not vertical integrated, they don't own their factories and it's hard for them to actually go to their suppliers and have the whole supply chain on blockchain. Which is technically exactly what we're trying to do at Sleeve, the current start-up I work at but anyways, that aside, it's harder to tap into that market. This is why for luxury brand brands, especially such huge brands as LVMH, it's much easier to do because they're usually owning their factories and they have all data in one place, and they can easily show it to customers. Other interesting use cases, I think Nike is doing something interesting with... I'm going to send you the database if you're interested, but I think they collaborated with one of the universities, and I think they are doing RFID plus blockchain sneakers or something like this. What I'm most interested in is actually Levi's and how they tracked happiness levels using blockchain. And they started way back, and I think for me it was the most unusual use case of the technology, very outside of authenticity and transparency. OK, I'm going somewhere I'm deviating somewhere else, so please course correct me.

Juliette Herinckx: Maybe to focus on that digital link between the physical product and the NFT, would that work with some sort of chip in the product? Do you think brands would have to manually implement a chip in all of their products and would they have to be unique for each product so you can identify each individual product? For example, take a handbag, if you want it to have a unique identity, you have to have a different chip in each and every single one of them. Is that possible for a brand to do?

Julia Chinakaeva: Uhm, well, no the chip itself won't be different or unique. It will be just a piece of technology, it's like a piece of... I don't know plastic and cords if you will, attached to the physical item, but it's when you scan it and it's the actual link, it's pretty much the code that would make it unique, so the uniqueness would be in the digital world I guess, unless you are, I don't know, putting a special... if you're signing it, or if you're if you're customising it in a very unique way, probably, but ideally no. You would have a separate bag that would be unique in the digital space.

Juliette Herinckx: OK. Because then, if you look at this technique for authentication. Someone who counterfeits products could still copy that chip or...

Julia Chinakaeva: I guess, yeah. If the chips were manufactured by let's say LVM and this particular batch was stolen, then they could remove this particular batch from their registry of NFTs. So, I guess it's still possible. Even blockchain or forging blockchain is somewhat possible because they're... blockchain only protects something that is already in the digital

form, but initially if you input the wrong information, it could still be... because then the wrong information to begin with would be protected by blockchain. But for those who try to forge it'll just be much harder because they would also need to somehow obtain those chips. It's a whole other digital level of complexity that may be skilful, craftsman could have gotten away with because they would, for example, manufacture incredibly similar Louis Vuitton bags, but now how do these craftsmen manufacture a chip and connect it digitally to the registry of LVMH?

Juliette Herinckx: How would the customer access the blockchain platform? Would they only see information about the product they bought? Would the brand manage that platform, or a technology provider for example?

Julia Chinakaeva: It depends on who the brand works with. So, in the case of LVMH, they're working with Microsoft and Consensus, so I imagine Consensus and Microsoft managing it. Perhaps it'll be integrated with... I think now they might even have something like blockchain as a service, but initially the code, the platform, of course belongs to Consensus and Microsoft and it is applied on LVMH inventory. Uhm, the way it is done now to my knowledge, I did not purchase a bag at LVMH, I spent most of my money on MBA, so maybe soon (laughs), but if I do that I would reach back and share my experience. But yeah, based on my knowledge I was talking about it, it's pretty much a customer logs online creates an account, and the rest is kind of automatically created and linked to the physical purchase.

Juliette Herinckx: I think it was launched already by LVMH, right? The AURA platform?

Julia Chinakaeva: Yes, exactly.

Juliette Herinckx: Would other brands collaborate with LVMH? Do you think it's a good idea? Or should they have individual blockchain platforms?

Julia Chinakaeva: Uhm, I think this is what I kind of "predicted", it's a big word but uh, based on what I've seen in my research, they would be kind of clustering under bigger or like biggest providers, because essentially the technology, the idea is very similar, but if it's replicated by several different providers, I guess it's just multiplying the effort, so definitely I see brands not necessarily maybe collaborating, but definitely clustering under or using the technology of the same providers. And I think in one of my last reports there were several like top five, top ten providers of the technology that mostly work either with luxury and higher end brands, or with lower, more affordable, probably bad word, but let's say slightly lower-end brands. And I think the reason for that is the entry point of the technology. I think it's probably not even interesting

at that point for some providers, such as Consensys to work with brands that don't necessarily have a very interesting level of revenue. But it's still a niche and that's why there are more and more start-ups in in that area as well. I think you were asking would brands collaborate, I think we've seen that already. Yet again I'm not sure about the collaboration part, I think the big brands were using similar technology, even from competing groups. Because it only makes sense for brands under the LVMH group to use the same technology because they were probably already using the same suppliers, but the competing groups, I think, uh, yeah, this is interesting. Maybe here it proves how it proves the level of benefit that blockchain provides as opposed to competition level that the brands are experiencing. Maybe I'll just go with that.

Juliette Herinckx: Yes, since Prada and LVMH are already collaborating for example, it probably means that the technology is big and interesting enough to go over competition. Maybe stepping back from blockchain, do you know of other solutions to authenticate items or fight counterfeiting for brands?

Julia Chinakaeva: RFID is another one and I think it used a lot in tandem with the blockchain because I think it also gives the real time location of the asset, and it could be interesting to have the real time data that is protected by blockchain. I don't think I know of other solutions in that area that could protect... Yeah, nothing comes to mind. But let me know if you if you research something.

Juliette Herinckx: Yeah, I mean mostly brands “manually” go after counterfeiters and try to eliminate all the fakes, but blockchain was kind of the missing piece to make it automated.

Julia Chinakaeva: It's not necessarily with technology, but yeah, yeah, no. I think apart from blockchain nothing can I guess solve the issue at that scale.

Juliette Herinckx: What about on the second-hand market? Do you think blockchain is also usable, and how would luxury brands take advantage of it? So, like second-hand luxury platforms could prove our product would be authentic without needing authenticators.

Julia Chinakaeva: Uhm, oh, definitely there is a huge potential for, I guess both the blockchain and second-hand because both of them are still not quite out there and kind of I guess at a commercial level. Especially if it's, I guess implemented by brands. We all know about several second-hand platforms like Poshmark. But I don't think brands embrace the second-hand as much up. However, they do collaborate a lot with these platforms and there is one in particular you probably might have heard of it. It's called Refund by the CEO and the founder Stephanie

Crespin. She has been in several panels held by Insead (I'll be happy to introduce you to her). So, she is using blockchain for her second-hand platform and it took off beautifully lately and she's all over the news all over media and a lot of the luxury high end brands are kind of chasing her to have their products on her platform. And yes, she's using obviously blockchain to give the final customer the peace of mind in terms of the authenticity of the product. If it's uh, for I guess, first hand purchase from the luxury boutique, the chances that it is inauthentic are very low if you're buying it second-hand from even these platforms, or I don't know through stores, it's much harder to prove that authenticity. And for those customers for whom buying a genuine product is extremely important, it opens so many doors. And I'm sure you read about it, but on the second-hand you were also able to see the previous owner, you can understand who pretty much owned it before you and it creates a beautiful story and kind of the journey of the garment or product before you.

Juliette Herinckx: And do you think luxury companies want to take that over like handle it themselves? Or would they be willing to collaborate with second-hand platforms?

Julia Chinakaeva: Oh, they do collaborate, especially the luxury second-hand realm, and especially during COVID times because they were sitting on so much unsold inventory. People were obviously not buying expensive bags for example because they were just sitting at home. And in order to not massively discount or, God forbid, burn, or discard their inventory, they quietly gave it to / resold through second-hand platforms, and now they're definitely collaborating with them. Because it keeps their brand value not diluted, and as I said, they don't have to discount the product and I guess it creates the beautiful story around the product for the next user and they don't have to be involved in scandals like Burberry when they were burning their inventory.

Juliette Herinckx: So, do you think that's why brands do not sell second-hand themselves? Someone we interviewed yesterday said luxury brands missed the mark by not launching their own platforms for a second-hand. Do you agree?

Julia Chinakaeva: Uhm, I think implementing any new way of selling is pretty much implementing a new operating model into their current operating model, so it requires more skills, more hiring, more brains, more hands. They might have missed the mark, but also maybe some brands are just not capable of it because it is quite different. I think marketing is different, people who would buy second-hand might be not their core customer, so there are there definitely things to consider, but there are brands who did a beautiful thing. Obviously,

Patagonia. Uh, so one example. Ideally, I would love to see brands do that, but for a lot of them it's easier to just give it away to second-hand platform at this point. Would they have been able to compete with platforms, I don't know, because marketplaces are so convenient. For the customer as well, because if you want a dress from Dior and a bag from Prada you go on one platform you order two things. It is delivered and you forget about it, whereas if you go separately just I guess more time, more logistics and all that. So, I guess if I were a brand I would try to play in both markets and I think there are brands who are doing not only just second-hands, but even rentals. They have both options for their customers. The new, the rental model and the second-hand. And even honest, I think in rentals blockchain could be interesting, uh, because I guess, yeah, if they could create a smaller chip that is sewn into the garment, then the person would know that they're renting an authentic dress.

Juliette Herinckx: And the blockchain would also link first hand second-hand. If you start implementing the chips in the first-hand items, then when they go on the second-hand market you can authenticate them. And potentially kill the middleman as well, get rid of all people working in second-hand having to authenticate items? Do you think that would end their jobs?

Julia Chinakaeva: Oh interesting, I never thought about it. Probably, you're right, there is a niche of people who authenticate. They probably should be slightly worried about their profession, but at the same time I usually try to refuse seeing technology as a threat. Let's revisit it in 10 years and see how technology affected my job (laughs), but at this point I refuse it to see it as a threat. It's more of a leverage for perhaps these people to utilise their knowledge elsewhere. Maybe they could curate collections, because all this knowledge of luxury items to such a crazy extent is incredible and I'm sure there are just other, maybe more interesting implementations of their skills, even using blockchain.

Juliette Herinckx: Definitely. Now about regulations, do you know anything about the EU potentially regulating these types of blockchain platforms?

Julia Chinakaeva: Interesting that you asked, I actually looked into regulations and we at the blockchain Intel start up, I think it might be in one of their deliverables as well, I'll browse through it, but they were working on, a scoring system for every country in terms of blockchain regulations. Back then, and I'm sure it moves incredibly fast, but back then there were countries that were absolutely against the technology and its implementation and pretty much in any in any industry, especially finance. I'm sure now it changed drastically in the last couple of years. I am honestly not aware of a regulation for particular platforms. Perhaps it'll be a better question

for Stephanie. I remember there was always that question of customer data protection because if the new person can access even the name of the previous owner it's already a grey zone for me. I personally don't mind, but I'm sure there are people out there who wouldn't want that, and so that's the question. How it is regulated, I yeah, I'm sorry I don't think I can help here because I did not research that or even I think raised the question for the blockchain, the technology and the brands, kind of the users of the platform, of blockchain. Interesting. Guess I'll read about it in your research.

Juliette Herinckx: Imagine if it becomes a monopole, like LVMH takes this technology and every brand has to join it and LVMH is still in control. Do you think that could be a problem as well?

Julia Chinakaeva: Yeah, it's another thing. I did say there will be clustering, but in a way, clustering is... it goes against the decentralised nature of blockchain, so it's a little bit kind of the monopolisation of technology that is supposed to be decentralised. Yeah, it's interesting (pause). Yeah, we don't want another Amazon, sorry Amazon. I think there will be several big players. I think it'll probably be more of an oligopoly in terms of technology providers. Just because you're writing it down, maintaining the platform as a lot of resources and you won't be, I guess, profitable if you don't have a certain critical number of brands, or even I think the blockchain itself as a technology would not benefit if there were not quite a big number of brands on the platform. But at the same time, I yeah, I wouldn't want to see one player and one provider of the technology. I personally do see it as a risk. In general, coming from Russia I don't like, I hope I'm not getting into trouble for them, but I don't like a power that is too big to move, to change, to diversify from. Think it is always a risk. Then we're risking being stuck with a president in this case for 26 years. Here it is always hard to get away from a certain technology if it's just one provider, you're right.

Juliette Herinckx: Absolutely, and it's hard to make it decentralised with luxury, it's different from a government where it's public, here you have to have people in charge.

Julia Chinakaeva: True and you're right, yeah, with blockchain you can set as many gates of I guess access for people using the technology and people outside of it. And I guess for just one company to hold the keys and kind of have it as their playground, I think it can be dangerous, yes.

Juliette Herinckx: I think I went through all my questions but if you have any other thoughts. Any other things you know about the technology of blockchain or like luxury in general, like the evolution of the industry?

Julia Chinakaeva: Well, yeah, yet again, finally now I just sent you the report on it as it is. It is going to be published with 7 agencies hopefully, uhm. I find the industry fascinating. I like how it kind of soaks in different technologies as it goes, it evolved drastically with all the evolutions that society went through. Now it's also soaking in kind of the fifth Industrial Revolution or industry 5.0 where everything is interconnected. Kind of everything is moving as one organism. Yet again, essentially what we're also trying to do at the start-up that I work for, and blockchain is a big part of it because ideally, this is exactly how you want the world to function in a way, it makes sense, but it's also scary. But In order not to have, for example, inventory, in order not to have clothes as collateral damage and this kind of endless guessing of the demand by brands you want to manufacture things on demand. You don't want to manufacture something that you won't sell, so that's one part of it. But you also want to make sure that all the interactions between the customer, the manufacturer, the fabric supplier, are protected. And I think this is where blockchain comes into play. Uhm, if yet again a customer wants something super unique, NFT's come into play. If you want the real time visibility into how everything is going, RFID and QR codes. If you want things to be manufactured fast and efficient, which is not at all the case with current manufactories. Unfortunately, both in Europe and Asia there are quite a few of the factories that are technologically advanced. Then you need to invest in robotics, that again are connected to the dashboards at the brands' side. Uhm, what else is there? Uh, there's an interesting version of robots that are called cobots, which is integration of kind of the human mind and kind of robotic hands or interaction of human and robot that, I think, is also something that is coming into on the fashion industry. Obviously, the time horizon is pretty crazy, but I think it will be interesting to look at it in about five years from now. AR, VR you, for example, you can shop not online, just browsing through the website. You can put on the glasses, and you can try a Chanel dress on the moon or something and then you're like OK I want the Chanel dress now. Obviously, exist only in the digital world, you press the button, everything is connected through blockchain secured as manufactured for you, you see the progress on your phone then it's delivered to your door, maybe by a drone. Who knows? Uhm and lastly, machine learning is another thing that is implemented in fashion industry, it is being implemented and it's mostly around sizing, or not even sizing let's say fit, because I think what a lot of brands are looking into now yet again not on a massive scale, but

some of them are basically completely refusing, eliminating sizing and kind of going back to the measurements. So, through machine learning you would be able to take your something that, for example Unspun and H&M did together, you go into a box, your measurements are taken automatically. No sizes, no nothing like this and then the pattern that the jeans are made from or based on, the building block of the jeans is the pattern, so these patterns are automatically generated and like printed out based on your measurements, it goes directly to the factory. And then it is again delivered to you. But for example, if you cannot access that box, you can send pictures of yourself and then through machine learning, the algorithm would know what would work, would be able to predict the best fit for you. Best measurement and uhm, you won't even have to go to the store or like worry about your size anymore.

Juliette Herinckx: That seems very useful to be honest.

Julia Chinakaeva: I don't know if that's too much information, but (laughs).

Juliette Herinckx: No, it's very interesting. I actually have a class about retail innovation and it's all about this type of stuff. Super interesting. Like we saw about Burberry as well, I think they tested out in a store: you would come in, captors would see what kind of clothes you were wearing, your size, your ethnicity, and then you go into the cabin to try on something you picked out, and they will show you a picture of someone who looks like you're wearing it. It's kind of a marketing way to make you purchase.

Julia Chinakaeva: Yeah, there are a lot of things happening, maybe it'll be interesting for you to skim through the reports, I touch a lot on that. I also co-wrote it with a guy, his name is Reoul. He's a 3D expert and he was just published in Vogue Scandinavia. So yeah, there are a lot of things happening out there.

Juliette Herinckx: And what do you think would be the priority for luxury brands? Do you think that blockchain for authenticity is a priority? I feel like it's more in NFTs, Metaverse right now.

Julia Chinakaeva: Oh, here's what I think. I think that there are buzzwords, and kind of trends, and there's a reality. And I think once the buzz and the craziness and madness about certain things dies down, it'll be an actual test for the commerciality of the technology. And honestly, I think implementing blockchain... Because once you do something once or twice and it's new then it'll be all over media. But it doesn't mean that it is widely implemented. Journalists, magazines don't go back, sit with a dashboard, they don't usually measure the implementation

of these incredible, but very scarce two or three use cases, for example. And this is also what I noticed when I wrote the report initially back in 2018. They were like “the revolution, blockchain...” blockchain was everywhere. I found no information on these particular use cases two years later, so I don't know after the first success if it actually created or made a difference for this brand or for the brands customers. And I think now a lot of the brands are working on it behind the scenes and for me Metaverse and NFTs is the noise, it's the buzz. I don't think that, uhm, it'll be widely implemented. I think brands would jump on it here and there for the publicity because it will be on Instagram, it will be on LinkedIn, and it'll be on all social media. But I don't think they would completely change their operations because it's a completely other ball game. Uh, and in terms of why it is the most important for brands now, honestly, I'll just use the conclusion I used in my report, and I think it is important for brands to realise the spectrum of technologies and business models out there and not... I think I'll stress that it is important to really understand both because I think success depends on innovative business models and operating models and an implementation of technologies. I think it goes hand in hand, you cannot just have rentals and I don't know, run it like a 70s laundry business or something. It has to be digitalised. So first yeah, brands have to understand and be very knowledgeable about the spectrum of what is available out there. Uhm, they have to understand the type of customers or their customers and what kind of technology and business model to select and perfect based on what their customer wants and then stick to it. And whether it's RFID or blockchain or together or VR, it'll be up to the brands to decide. I don't think there is one recipe fits all kind of situation.

Juliette Herinckx: We will see what unfolds from all of this. OK, thank you so much. I think this is a lot of information to take in. But thank you so much for helping, so is it fine if I cite your name in my thesis?

Julia Chinakaeva: Feel free, of course. I'm happy that all of this picked up interest because when I just started for me it was the initial shock of the industrial problems and I don't think there were people out there uhm choosing between “Should I go to IB or should I do consulting or should I try to deeply understand the problem and find the solution?” and the fact that now there are degrees or courses in that area, there is actual research, there's awareness, think it means a lot, and if I can contribute very happy to. And as I mentioned, happy to connect you further to people who are on the forefront of the blockchain. Because yet again, I'm more on the manufacturing on demand. I can help you further on that topic, but with blockchain uhm if

you have more questions, it'll be better for me to connect you to people who deal with this on a daily basis.

Juliette Herinckx: That would be great. Thank you so much!

9.7.3. Interview with Graham Wetzberger (Founder & CEO at Luxury Appraisals & Authentication)

Juliette Herinckx: Can you maybe start by introducing yourself? How did you come to work in the industry?

Graham Wetzberger: Sure, so my name is Graham Wetzberger, I'm the founder and CEO of Luxury Appraisals & Authentication, where we advise clients on the value and the authenticity of anything in the personal wearables sector, luxury wearables, so handbags, watches, jewellery, clothing, accessories, shoes, sneakers, etc. Prior to that, I worked as chief authenticator for The RealReal, which is a luxury resale platform, for seven years and grew that business from a team of 50 to a company of 2500 people, took the company public on the NASDAQ stock exchange. Prior to that, I headed a buy sell trade category in authentications and appraisals for Bag Borrow or Steal which was one of the very first companies to do rental. Rental is still a struggling category, people just can't seem to turn a profit, and that was very much the case there, we moved to buy sell trade which is another revenue stream. My background is in fashion design, my educational background is in fashion design and art history and the fashion history. I never worked a day as a fashion designer in my life, but it certainly was a good education on how quality goods should be made and great terminology and vocabulary and being able to kind of in your mind reverse engineer an item. Say yes, this makes sense or no this doesn't make sense, to differentiate between inferior materials versus superior materials, constructions, hardware etc. Currently, my clients range from individuals who just want to make sure something they purchased off a website is real, or maybe they're an entrepreneur and they have a little shop on a website, and they sell and buy, and then you know I have multibillion dollar companies who I consult with on a more enterprise level, either they're investing in authentication practices, marketing, messaging, operation practices, legal liabilities. I work with the government in cases of seizures and fraud cases. And well, so I work for law firms and investment and insurance companies as well and making sure that people are not being scammed by counterfeit goods. Blockchain was first started talked about a few years back and some very innovative people saw this non tamperable chain of custody or chain of provenance as something really important in uhm... improving some things, in showing a

lineage of an item's ownership and movements to show that it came from the manufacturer directly and has been living its life as of such, as a way to guarantee that the pieces are authentic. It's kind of evolved from just a simple chain of ownership to NFTS, to digital renderings, to all kinds of different extrapolations which are really interesting, and for different categories as well there's different approaches. You know I think we talk about provenance when we talk about fine art at auction and things like that, you know, they went from the artists, the first owner, etc, etc, but we all know that forgers can add things into the "catalogue raisonné" and forge proof of sale and different things like that. So having something that's tamper proof is very attractive to the community and it helps to add value to the piece.

Juliette Herinckx: What is your personal opinion about the technology? Do you think it's going to help the second-hand market?

Graham Wetzberger: I think it will, I think it's early days, and you know a lot of businesses were kind of basing themselves on like the Ethereum blockchain and now we see people kind of moving away from that. There's a lot of fluctuation and a lot of movement in this space, and I feel like one will win out right, or you might end up with like two. Like your iPhone and your Android, right, like before there was Nokia and Microsoft phone and all these different things. The market has to consolidate and once you have that consolidation, then you can grow that universally. It doesn't do anyone any good if all of these different blockchains are speaking totally different languages and don't integrate with each other, you know, I think the very early wallets were very finite, and they're getting better, they're accepting more different types of tokens and different types of collateral, if you will, and that's what we need, we need like a universal receptor for these different things. And we have to allow actors at every stage of an item's lifecycle to add to the item's provenance and history. I mean it has to start with the manufacturer, whoever makes the item has to kind of mint that token at that point in time, work with someone to do that, then, where it goes to be sold the first time, who's ownership does it transfer to, how do they then transfer ownership to somebody else or they gift it or somebody parents it. I mean if it's just stagnant, there's no point to it, if you can't add to it, there's no point to it. You know if it's a watch, like when you get it serviced, they can put a stamp on it, you know, and keeping all those things that would be like a paper receipt obviously, but on the digital ledger. So, it's only as good as who has access to it and if you add to it, otherwise it's incomplete.

Juliette Herinckx: And do you know anything about how brands would link the physical item to this digital twin? So, via some kind of RFID tag or...?

Graham Wetzberger: Sure, yeah so RFID and NFC have been talked about. Some places are doing 3D renderings with many cameras by looking at super magnified images and thousands of data points to enter an object, so not only do you have the physical watch, and you can keep it the physical watch in a safe, but your avatar in Fortnite can then wear the watch also, and you know show it off. It's not just buying a digital asset, where it's only for your avatar, it's both physical and digital. So, I think there's a lot to be said there, similar to like NFTs as art, you know people want that token, but they also want something to show. Because it's still hard to provide people to comprehend like if you're just showing me your art on this little screen like I don't know, that's kind of cool I guess, so why is it a hundred thousand dollars cool? You know, when it comes with that physical item like Dolce and Gabbana did a whole let's call it a capsule where they did the NFT rendering and design of the gown, but they also sold the actual gown to that person, the physical tiara. I mean how often are you going to wear a tiara in everyday 21st century life, not very often, but it's cool to have it, and then to have the token of it as well, so I think we'll see more and more of that. NFC and RFID, they're suitable, several luxury brands have been implementing them into their items as of late, however, they're kind of turned off, and by that I mean they're not consumer interfacing. It's just for kind of inventory management, logistics, inventory control purposes. And they can scan it at point of sale and assign it to a customer service portfolio, but they have to at some point turn it on, that's where the biggest benefit lies. Because then you can communicate with your customer, you can remind them about different things, you can suggest, sell, and interact and engage with these customers that in no other way we have done so before. And it makes people feel like they're part of the club, because they have that designer item, but they also have the designer in their wallet. You know it's kind of along the same lines as like alternate asset investment, where people are buying a share of a Rolex or a share of a Birkin bag as an investment piece. Yeah, it's a fascinating world.

Juliette Herinckx: So, it hasn't happened yet, that brands actually use NFCs, RFID?

Graham Wetzberger: So, I mean they're using it, but they're not engaging with their clients to use it. So, you know, if you scan a Louis Vuitton bag on your phone it will look like this (shows phone). So, it's coded, you don't really know what it says, it's not in English or any other known language, it's just code. So, they have the opportunities when you scan it to divert you to the

website or you know, engage in different ways, but they're not doing that yet. But there are hundreds of thousands of pieces out there that already have a tag, they're just not talking yet. Back in maybe 2017 the handbag designer Rebecca Minkoff started putting 2D or QR tags in all of her items, and then you could scan it and it would say like we're having a pop up this weekend, or you know if you bring your bag to this bar, you get 10 percent off your drink, or something like that, so that was a very kind of early ways. I think they found cheaper ways to engage people on social media than scanning a QR code, but that was very innovative. It was not RFID or anything to do with blockchain, but it was a first step into that.

Juliette Herinckx: Do you think brands are then going to move their certificates of authenticity completely to the digital format?

Graham Wetzberger: It makes sense to do that, I mean at least duplicate it right. Like it's nice when you buy a watch with a big beautiful box and there's a certificate with a serial number, and that's nice, but these go missing all the time. Even if they have a digital partner to that, people are still going to want to have that paper. I mean maybe not like youth culture, cause it's maybe more disconnected with paper, but older generations really love that tactile thing, they like to, even if it's just in your sock drawer or something like that, right, they like to have that. But then again if you lose it, you have a digital token to rely on which is great, and I think if they start wanting that, when people sell these items, the buyer is going to insist on getting the digital copy as well, and then, how do you do that, how do you transfer ownership? Is it a simple PDF or is it part of the blockchain? And if so, do you have to go to the brand and does the brand have to transfer ownership? Or the jewellery store? Or what have you, you know how do you kind of prevent fraud, but still allow access? I think that's a difficult question.

Rosalie Ghislain: And if they're using like RFID or QR codes do you think it's still copyable by counterfeiters?

Graham Wetzberger: So uhm... It was only a couple months after Louis Vuitton started putting tags in their bags that counterfeiters started putting tags in their bags. And when you scan them, it comes up in a different format, but the first ones were taking you to louisvuitton.cn, so the Chinese website, and they were like mmh no that's not right. So, then people were reprogramming then to take you to louisvuitton.com. So, the counterfeiters are engaging with the customer more than the actual brands are at this point, which is kind of crazy. So yeah, I mean they counterfeit two things, everything and anything, like it will help them make a more convincing fake they'll do it. So that's why you know you have to educate the customer. If the

Rolex brings you to X blockchain and the counterfeit brings you to Y blockchain, you have to be able to tell them the difference right. So, you have to teach the customers the difference. And just very early Internet kind of 1.0, the counterfeit websites would be like lv.com instead of louisvuitton.com and there would be all fakes. Since then, brands have bought all of these other URLs and won them in court cases and seizures, but I remember back in the days when you went to tiffanys.com and they were having a one-day 50 percent off sale, it's like it's too good to be true, so it's the same thing, like it could be a real blockchain ledger for a counterfeit item. So new technology is amazing, but also frustrating, at the same time.

Juliette Herinckx: So, do you think the technology will help if counterfeiters just end up following the trend?

Graham Wetzberger: So, I guess the point of making a counterfeit is to make it cheaper, so you can sell it cheaper. That's the incentive for the buyers, to buy something at a discounted price that you normally couldn't get a discount on. So, they do spend like 99 percent of their focus on the outer side and the exterior because you want to fool the eye. I think copying the technology is going to be kind of like the last things, and those are only going to appear on the most highly sophisticated counterfeits, which is going to the top end of the market, so you're going to see it on very high-end watches, 20.000 and up. You're going to see it on very, very high-end bags and jewellery possibly, but you know these kind of like sub 1000 or sub 2000 USD things, I think it's too much of an investment on behalf of the counterfeiter to go. But the cost of RFID and NFC is going way down, the cost of developing your own blockchain or buying space on a blockchain is going down, so you know every day becomes more and more affordable to get on the blockchain. Something that some resale companies are doing is creating an NFT at that point, at that secondary point of sale. So going on to their ledger and then, if you sell it back to the company, then you need to add that. So that's an interesting one, so their certificates of authenticity are NFT-based and blockchain-based. One that I worked with is called Her Age out of Milan, I'll email you that information, and I can put you in touch with Alba who's their head of merchandising and she would be open to talk to you too. So, you know that's an option of kind of skipping the manufacturer, the primary point of sale, and creating a blockchain ledger only in the secondary market.

Juliette Herinckx: And do you think it's possible as well, for very vintage collector items? To link them to the digital world when they're already spread across the world?

Graham Wetzberger: Yes. Christie's, the auction house, partnered with... archery maybe it was called? Basically, a blockchain provenance business, and they were doing new art meaning like stuff that had come out of the artist's studio, but they're also retroactively going and entering the old provenance that we have from auction catalogues and things like that, the traditional style, and entering it all digitally or digitising it is like the word right. So, then these pieces kind of move into the future. Just like with vintage clothing, if you add it in the secondary time and just add enough object identifiers around it, it can become a unique piece. So sometimes that's serialisation on an item, other times when items have had serialisation it's image recognition and macro photography, and then just the different taxonomy of identifying the object to try to make it as unique as possible. And then sometimes you have to kind of implement or add like some kind of overt serialisation to the piece, if it doesn't have one, then it's simply to common which... there are firms with different kind of solutions to this problem, like invisible indelible ink, some of them is applying very small barcodes, or even a die that has a unique manmade DNA strain to it, so it's crazy unique. But also then verifying those things requires a lab setting or working directly with that company so that complicates it as well. So, it is possible, but is it feasible at scale? Is it affordable to do it 10.000 times a week or something like that? Not quite yet. It'll get there.

Juliette Herinckx: Currently, since the second-hand market is growing so exponentially, how do you think the authentication process has to evolve, are you hiring more people?

Graham Wetzberger: Yeah so it's still pretty human heavy. You know, there is some artificial intelligence and image recognition software that's out there, but the data is only as good... well the machine is only as good as the data that you add to it, so if you mess up and you say a counterfeit item is authentic, or a brand changes - this happened just a couple of months ago, Chanel has put serial numbers in their bags ever since 1986. Well, a few months ago they changed the shape of the 3 from having a flat top to having a curved top. The machines looked at it and they said no that's wrong, so it has to be fake. Because every item in their data set show the flat top. So, it takes human research to then find out that the machine only knows what it knows. So humans have to teach it, so now we can teach the machine that the current top is okay if the digit after that is a one, but not okay if the digit after that is a zero. And I'm sure the people at Chanel weren't doing this to stop counterfeiters, someone just changed the font. That's all there is to it. And they don't care, they know it's real cause it's coming out of their factories or affiliates. So you know, there's that. And we would like stronger machines, stronger tools. Magnification is really great these days because it's very affordable to get a

camera that magnifies a thousand times. Five years ago, that was a 5000 USD piece of equipment, and now it's 30 USD, and you can get it from Amazon the next day. So, we're looking at much more detailed pieces because counterfeiters are getting better, and in some cases genuine items are getting worse quality to be honest. They're making more and more and more of them, not to belittle different countries, but like normally your leather goods are to be made in Italy or France, now we're seeing them made all over Europe and even the cutting happens in Asia, and the pieces are being brought over to Europe and then being finished. So, they're just less exact because they're making so much more and the quality control is not the same, so it's starting to blur lines a little bit. So, you still need a human to analyse this data, but once you analyse it, then you can put it into a machine and you have it compare these data points which is great, but it works better for hard luxury, like a watch or a piece jewellery, compared to soft luxury. You take a picture of hard luxury, and you don't have to worry about it being pulled or twisted, it's hard and it's set, so soft luxury with leather, with fabric or things like that, you always have that component of manipulation that's possible which makes image recognition harder. I think in the next five years we're going to see some really big leaps and bounds with autonomous machine learning, especially for that mass markets luxury goods, things that have logos all over them, sometimes those are the easiest things to reference, as opposed to just like a black leather bag. Because yes, we know it's a 33 billion USD business this year it's going to be 75 billion in five years, there's simply not enough human experts out there to handle that volume. That being said, I'm training new people like every month to do this, and a lot these resale companies are making big investments in bulking up their teams, so they can scale with the growth of the industry. It's a good problem to have, growth is a good problem to have, and I'll solve for it whatever we need to do, so, I won't be getting a lot of sleep, but we'll be working hard.

Juliette Herinckx: Do you think the number of fakes is increasing as well with the boom of second-hand?

Graham Wetzberger: So that's interesting. For the first time, and I can't remember the source for this, but during COVID actually, they saw the number of counterfeits in personal luxury goods go down. Normally the only way we know what's being fake and where it's coming from is what we see, by customs, Homeland Security, border patrol all of that, and before 95 percent of it was from China. Now it's only 85 percent. We're seeing more from Turkey and more from Vietnam, so that's interesting. Either they're getting better at shipping it, but the Chinese Government has begun cracking down on domestic counterfeiters, because of the growth of

their middle-class economy. Before it was like very rich, very poor and the rich people would never buy used, they would just buy brand new, and the poor couldn't afford it. Now there's this huge growing population of middle-class people who want to buy a resale and they don't want to buy counterfeits, and they know the counterfeits are coming from their country, so they're pushing their government to crack down. So, the government actually is teaching classes to their inspectors and things like that, on how to stop counterfeits, and they're being much more aggressive about counterfeits being sold in their own country. So, I think it's society dictating to government kind of what to do and saying, "we don't want to be fooled by this". It could prove to be a shift in counterfeiting, of course, if there's still money to be made in illegal trade, someone's going to do it, but they might shift maybe from Louis Vuitton bags to Nike sneakers or fake pills, which is not good either, but they might just shift the products they're manufacturing. They can make anything under the sun, it's just what's most profitable. So that will be interesting to see. But I don't think it's going to stop anytime soon, and plus there's tons of stuff that's already in circulation that's already been manufactured and sold once, so as more people adopt resale, they're going to take things from their closet and put it out into the marketplace and some of that will be counterfeit. We love to stop it and catch it and educate the customer, that this is counterfeit and then oftentimes they'll destroy it, or they won't request it back if we have it in person. So, all of these retail companies end up with a lot of counterfeits just because the people selling them, once they find out they're not real they don't want them back. So, it's a shifting of how the consumer values genuine pieces versus counterfeits.

Juliette Herinckx: Actually, when you find a fake, what do you do with it? Do you just destroy it or go after the producer?

Graham Wetzberger: So most times they're coming from individuals, and I say that's like friendly fraud, they don't know it's a fake or they say they don't know. It's always like "my sister gave it to me" or "my boyfriend gave it to me", it's always the same story too. So normally we inform them that it's not genuine and ask do they want it back. Oftentimes they don't, sometimes they do okay, but we have to make a note to their account that they possess this counterfeit item. The counterfeits that we retain, we use them for training a lot, so they do have some value there and some companies will dissect them and see kind of the guts of the item, how well they're getting it versus the real thing. But only in the cases where it's a business case, where they're trying to sell multiples of this item and a large amount of money, is it worth it to go after them for a civil offense. Because lawyers cost a lot of money and you really have to be able to prove an intent to fraud, if you're going to get large damages, and you know, while

it's illegal to knowingly possess and sell counterfeits in the United States, it's not illegal to own them here. It's different in countries in Europe. So, you have to pick your battles, I have definitely worked with police stations, with FBI and with Intellectual Property Council of different major brands to let them know when we encounter fraud to see if they might have an ongoing criminal case against them; if they do, we'll provide any information we can. But right now in the States it's very much more like a civil matter than a criminal matter, unfortunately.

Juliette Herinckx: Do you think they're doing enough for the fight against counterfeiting on the legal regulation level?

Graham Wetzberger: To be fair, no. I think the bad guys today are the Facebook and Instagram, they are just turning a blind eye to all these ads, and they say they take down hundreds of thousands of ads a day, but it's not enough. I spot and I report fakes every day but it's hard to report on Instagram because you can only report if it's your intellectual property. I know it's fake but I can't report it, so I have to say it's a scam or it's misleading, it is, but... in front of the US Congress, there is two bills, one is the shop safe bill and it would put responsibility on those third-party platforms if they allow a vendor to sell counterfeits, and it forces them to turn over the information about the vendor to the party that's suing them or that's claiming intellectual property infringement, but I mean, you guys know the US, it's crazy messed up and our politics is crazy messed up, so I don't know if this bill is ever going to get to the front of the list. We're trying and the trade unions who represent all of the American manufacturers, from like Nike and Adidas and Tommy Hilfiger, Calvin Klein to even much smaller businesses as well, they all want these bills, because they want to protect themselves and the American consumers, but we're not holding our breath that it's going to happen this year.

Juliette Herinckx: And on the European level, I don't know if you know anything about it, but is it better?

Graham Wetzberger: To my understanding it's better because that's where a lot of the luxury houses are based, in France and Italy and Switzerland and Germany and Spain and Portugal even. It's similar to the Chinese situation, it's in your house, in your face, so you really want to protect your cultural heritage, these brands that are kind of pillars of... that you're proud of, so you know, in Italy, I think if you get caught buying a counterfeit, you're sued like 1500 EUR or something. It's much stricter and Italy and France, I know. It's still happening, but there's actually penalties for the buyer which is great.

Juliette Herinckx: Maybe one more question about high-quality fakes, where do you think customers find these? Because I'm only picturing smaller, cheap manufacturers.

Graham Wetzberger: Sure, right. So, you have like your Chinatown fake, canal street bus stop kind of fakes and then you have more sophisticated fakes. And a lot of that is happening via Reddit. There's the RepLadies on Reddit and they show pictures of like how good it is versus the real one, and then a lot of it has been happening on WhatsApp, and there's kind of brokers, people will reach out to someone else, so you know I want this item and then it touches somebody else. A lot of it is being done piecemeal, so they just ship one item, as opposed to a whole container of items, which is much harder to catch, but if you look in places like Seoul, Moscow (not so much anymore), but they have whole shops just to sell counterfeits and they're extremely high quality, and it looks like you're in like a legitimate handbag store except they're all counterfeits. And that's just like part of this counterfeit culture where people are just fine with buying it, it's kind of the flip side of the coin. So, it's a little more difficult to get them into the States or into Europe, but they're all coming from very established business in Asia.

Juliette Herinckx: So, it's mostly consumers intentionally buying these fakes?

Graham Wetzberger: Oh yeah yeah. I think mostly they want a fake to kind of fool everybody else, they know it's fake but it's their little secret, they want to be able to walk into Chanel wearing their fake tennis shoes and the salesperson not know. Or they are nefarious and they're buying the fakes and then they're trying to sell them as real, so those are like the fraudsters who we have to watch out for. So, it's a new fight every day but it's kind of the same bad apples.

Rosalie Ghislain: How do you think blockchain would impact the second-hand market? Would it kill the middleman, as in take over the second-hand, or even maybe kill jobs of authenticators?

Graham Wetzberger: So, you're still going to have to have someone to verify that what's on the blockchain matches the physical item, and that needs some attention to detail. Maybe you could take a fake Rolex and you could inscribe the serial number that's on the blockchain. So, I don't think it's going, and I think we're never going to get the majority of the products of the secondary market on the blockchain. Maybe in 50 years or something like that, but right now it's trickling in. So, I don't think that's really going to affect the job of authenticator, it could help it, it could change their job a little bit, and just become another resource for us to use, which I'll take any new resource any time, whatever it is. I don't think it will hurt resale if anything I think it'll add trust to the resale market, people who wouldn't normally buy used, if

they have another way of feeling... just another avenue of trust, they might then buy something on the secondary market instead of primary.

Rosalie Ghislain: Okay. But do you know the Aura project being the blockchain platform for a lot of luxury brands? They actually said they would partner with some resale platforms, such as The RealReal or Vestiaire Collective, and when the first buyer would resell the product, the resale platform would contact Aura and they would have access to the blockchain giving them the certificate. So, on that part, how would authenticators intervene?

Graham Wetzberger: Sure, so I mean that's going to be all contemporary product moving forward right. So, any like new product which is great if you can see a piece and it's 2022, hopefully, you have some point of contact and you give them a serial number or you give them like the readout from your RFID scan and then they kind add your ledger. I'm not exactly sure how it would work, they'd have to figure that out, and they have to kind of like plug it in to the current pipeline, point of sale system, with that resale platform they're kind of using because it's too much to do it manually outside of the system. They would just have to kind of ping it and, but then you know on the other side of the coin is any old product coming in, can they add that to Aura's blockchain as well, and what do you have to do to add it? Do you have to scan the barcode, or do you have to enter the code, or this or that? And if it proves too lengthy or too expensive, the resale platforms aren't going to do it because they're operating on very small margins as it is. And then something like The RealReal, it's all centralised right, it's all one company, they take possession of everything, whereas Vestiaire Collective, it's all over the place. They only take possession after the point of sale and only for certain items, so really it could only be those items that they are expecting in person that could get added to the blockchain. And I'm glad that they made that statement, and it's interesting because Aura is LVMH, Prada and Richemont and not Kering. Kering and LVMH are enemies right, but it's Kering that has an investment in Vestiaire. So, I don't know, it's nice that everyone's playing friendly, but we'll see when everything gets down to brass tacks what will happen. You know I think there will be several mergers and acquisitions over the next few years, and I think the primary market, especially those larger consortiums want to take more and more ownership in the resale world. And this could be a way for them to do that, to kind of have some oversight without them launching their own resale platforms which could be cannibalistic for the brand.

Rosalie Ghislain: Thank you!

Graham Wetzberger: If you have other questions, let me know and then I'll make an email introduction to Alba at Her-Age and she can talk to you about how they're using NFTs in the secondary markets.

Juliette Herinckx: That would be great, thank you!

9.7.4. Interview with Alba Figueras De La Parte & Ataman Ersan (Co-Founders at Her-Age)

Juliette Herinckx: Can you maybe start by introducing yourself, how you came to work in the industry and what you do at Her-Age?

Ataman Ersan: Okay so I'll start. My name is Ataman, I'm originally from Turkey, it's been five years that I live in Milan. What I'm doing at Her-Age is I'm co-founder and chief marketing officer in the company. The idea came up during COVID actually, at the second wave of COVID, like let's say autumn 2020. For personal reasons, we left our jobs me and Alba and our third co-founder Alessandro. When we left our jobs, the conjuncture in the world was a bit broken with COVID and everything. At that moment, we started seeing each other regularly because we were also almost neighbours at that moment, and very good friends. While seeing each other and not currently having any business, we received some of Alessandro's grandmother personal collection, and then we wanted to place this on some marketplaces. We realised that for high-end luxury, we didn't find a marketplace where we could position the pieces. Taking pictures and posting them on a marketplace is not what luxury represents actually. And then they're mostly promotion and discount oriented. And while we were trying to get rid of the collection we had, we thought why not enter the market because in Europe, it's still a concept that needs to grow. The market was really competitive for example in the United States, in the UK, but in Europe, there are still some stuff to do. We thought how can we differentiate ourselves in the market, and the idea of Her-Age came with authentication like showing the luxury what it deserves. Furthermore, we realised that authentication papers are not really reliable neither. So, we wanted a secure place to stock information and therefore started to implement the blockchain. Just three friends coming up with an idea.

Alba Figueras De La Parte: But we studied the market for one year, the website has only been online for six months. Before that we studied the market, all the problems with counterfeiting, with positioning, everything. Then we came up with the blockchain solution.

Ataman Ersan: Exactly. So yes, and then, since May 2021 we opened the offices, we established everything saying okay this is the business that we want, because all three of us came from classical businesses. We worked in brand management, production. When I say classical businesses, I mean businesses that produce clothing and put it in the market to sell it. This could be our personal opinion, but from a business owner point of view, these businesses have huge costs with lower margins. Fashion is also the industry that is polluting the most. So, we thought if we own a business, we don't want to enter production and the circularity attracted our attention a lot.

Juliette Herinckx: How did you come up with the blockchain? How does it work?

Alba Figueras De La Parte: One of our aims was protecting the market of second-hand, because it's full of counterfeits. We were looking at each solution individually, and we met someone who is our partner today, he's in tech and knows about blockchain. We found this solution incredible, each product that enters Her-Age will be protected and will keep the memory until the end.

Ataman Ersan: The first main idea is to authenticate everything while keeping the information. Sending you somehow a PDF certification that would work, but it's still not enough somehow. So, the blockchain is a secure environment where you can keep the information. But furthermore, while studying this, how we can keep the information, we also realised that NFT helps physical items to have a digital value. You can have different interpretations of NFTs and different usages, and now this is still a big bubble and a big question for companies, but currently the way we use them is mostly for the authentication purposes, for the product information after sale. But for the digital value application, on any website you can sell NFTs like Open Seed etc. Our aim is not only to use it as a static certification tool, but also more for the future, you know how in luxury now like Chanel, Hermès, Rollex products increase prices, become more exclusive, people are making investment with the physical value. So why not also keep the digital value and build it in the future. It can also be metaverse compatible, it could be tools usable in the metaverse as well.

Juliette Herinckx: So, when you receive a product, you authenticate it first and then give it a digital identity with an NFT?

Alba Figueras De La Parte: Exactly.

Juliette Herinckx: And how do you proceed with the authentication? Do you have authenticators?

Alba Figueras De La Parte: Exactly, we have the main authenticator that is Graham. And then of course internally we also authenticate, but we're not as skilled as Graham. For us it's a physical check, and then Graham is our mentor. We already received a fake product, we got Chanel trousers that looked perfect, but they were fake. It was difficult for us to analyse, and then Graham explained the problem to us. Little by little, we're doing that on our side too. But our process is like this: people send us the photos, we check with Graham, we accept the product according to some filters, they send the product to us, we have the second check with Graham, and then if nothing's wrong we post it on our platform.

Ataman Ersan: As you see we don't deal as a peer-to-peer company, we are a fully managed marketplace. We really get the products here; we are a consignment-based business. Most of the businesses are peer-to-peer, they just act as an intermediary between the seller and the final customer. The company says ok, I'll send you the money, ship it to the final customer. But during the shipping, it could have a misstep. For example, when you post a picture, the timeframe between the photo being posted and someone buying it, there could be a default in the product. Most P2P companies have a really high return rate, which is not comfortable on the CRM basis. So, we didn't want these customer relationship problems, we didn't want huge returns, but at the same time, as Alba was saying, we really want to fight counterfeiting. When you fight against counterfeiting, you also fight against a lot of stuff, like illegal labour, work rights, etc. They're consequences.

Alba Figueras De La Parte: Exactly. For example, Vestiaire Collective is peer-to-peer, they have 5 million products on their platform, you can find any kind of luxury product, but that could be socks. For us, to go against counterfeit and to protect the market, selection is important. We can protect the market, we can use NFTs, we share them with our final client, and the final client can always keep it and transfer it in the future if he or she wants to sell the product. The protection is transferred. This is the way that we find this solution protects the market we're entering.

Juliette Herinckx: If brands themselves were implementing NFTs on their products, would a peer-to-peer model work?

Ataman Ersan: That depends. Actually, it would facilitate our job. Because if the brands implement NFTs, it would be easier to sell on the second-hand market. It would reduce our costs.

Alba Figueras De La Parte: The people that are into the second-hand market. There are millions of products on the second-hand market, so a lot of clothes and accessories around the world. The people need to enter this culture of protecting the products, and this is something that we are developing. It's going into the market, first for luxury products but I think this can be open to any products. It's a culture that we want to be implemented for protection. You could do it before selling the product, we're doing it after the first sale. People feel better with the NFTs, with the authentication. At the end we'll be artificial intelligence.

Ataman Ersan: I completely agree with Alba. If little by little companies like us show the culture to the public, say if you're paying 5000 EUR for a bag, why are you not questioning its authenticity? Why is no one securing this? Companies like us can revolutionise the market. If there's no demand, it looks like an exclusive service, but it shouldn't be, everyone has a right to protection, even in the second-hand market. When you buy something brand new, you're fully covered, but why not for second-hand? There are second-hand bags costing 50,000 EUR, it requires customer rights as well. The biggest indirect competitor is obviously Vestiaire Collective, they're doing really good, but we have a different positioning based on what we are doing, because we have another sensitivity, and we want to represent this different approach.

Juliette Herinckx: What do you think of blockchain as a way to tell a story? If you had blockchain implemented from the start of a product's lifecycle, you could see all the owners, the supply chain process?

Ataman Ersan: This is not a marketplace job but a brand job. Alexander McQueen, Pinko are doing it. We support the idea because it's true that since the beginning, the customer receives the transparency, where it was produced, the materials etc. Ok you can always put it somewhere on the receipt, but it's not the same with a QR code that you can always check. But there is one point which is cool, of course this information will be so helpful for the second-hand market if all the brands are doing it. More transparency from the start helps give the product a second life in a proper way. So, we definitely support brands doing it.

Juliette Herinckx: But do you think brands could take advantage of the technology to do the second-hand themselves? If they have a platform with a "sell" button for owners of their products to sell their product second-hand directly without an intermediary?

Alba Figueras De La Parte: They are seeing that the market is opening, that customers are more used to second-hand. But at the end, Alexander McQueen will sell Alexander McQueen clothes, it's ok if you're a lover of Alexander McQueen but for example if you're like me and wear everything second-hand, if you want to buy something, you want choice. They are taking the opportunity, why not, at the end it makes sense, but I think multi-brands second-hand platforms have a real advantage because the final client wants to see a large selection and go through an open sea of products. All these brands could have their own platforms but also collaborate with other platforms.

Juliette Herinckx: Yes, that's the thing, for example Aura, I don't know if you know it, the LVMH platform? It has Prada on it as well, so brands are collaborating on one blockchain platform. So maybe one platform is going to take over and all products are going to end up on there.

Ataman Ersan: Yeah, in any cases it's not fearful for us that they take advantage because at the end it's legitimate, but the thing is that for an established brand producing collections etc. to extend the business, it will take time, they will do it smoothly. For example, the brands renting for fashion shows, they have subcontractors or consultants for them. So why not hire them? Do you see what I mean? You will always need some collaborators, people in the businesses know things better than you. What can happen is of course if little by little the second-hand culture implements itself within the brands, they can start making this transformation but it's not going to steal our business. It could be very much long-term.

Alba Figueras De La Parte: For example, Gucci Vault is also second-hand. Their selection is not so big. It's the best products from the archives, they're doing something important for fashion but it's different than us. If they did it like us, it would not be cohesive business-wise for them in my opinion.

Ataman Ersan: If your question is are we afraid that brands directly come for our jobs, I don't think so. It's not going to be like that, it's a different business dimension.

Alba Figueras De La Parte: A platform for brands to sell their fabrics makes sense, because they have so much fabric and a lot of people who are interested in buying them.

Juliette Herinckx: But do you see brands collaborating with marketplaces in the future?

Alba Figueras De La Parte: They are doing it already.

Juliette Herinckx: Would a brand come to you asking to sell their products on your platform?

Alba Figueras De La Parte: Why not. We are always so happy to help them. And I think they will do it. For example, at Vestiaire Collective or The RealReal in America, The RealReal is a bit better, but you see that Alexander McQueen or Gucci are selling their clothes on these platforms, this collaboration is amazing for them, but at the end the image, the positioning and everything is a little bit... I don't know, I think if they collaborated with us, it would be incredible for them too.

Ataman Ersan: We believe that brands would have an interest to align their images in the second-hand market by collaborating with us, yeah.

Alba Figueras De La Parte: For everything. We are protecting their products; we are giving the best from the product to the client. I think it's perfect as a chain.

Juliette Herinckx: Going back to how you use blockchain, do you link the physical product with the blockchain using a QR code or something?

Alba Figueras De La Parte: Exactly. So, our NFTs are on the blockchain, if they're not, it doesn't work.

Ataman Ersan: So yeah, you're visualising your NFT, of course you have your account and everything, but it's easier when you have a QR code to scan and enter your account. You can also share your QR code with others, and if your friend has the same supplier, you can view their account. The QR code is an access option.

Juliette Herinckx: Where do you find that QR code? Directly on the product?

Alba Figueras De La Parte: Depends on the product, if it's washable yes, but often times we put it on a card and the person can use that.

Ataman Ersan: For the washing concerns, for the moment we try to provide the code on a letter that we send with the access and everything that people can reach. Maybe it's not always comfortable to have a QR code.

Juliette Herinckx: How do you see the market of counterfeiting evolving? Do you think they would adapt to the technology and copy the QR codes?

Ataman Ersan: I don't think that they would.

Alba Figueras De La Parte: The QR code could be copied. They're already doing it with the Green Pass for example. But the NFT inside your wallet is impossible to copy.

Ataman Ersan: There could be another scammer organism that would authenticate, but then how do you justify in your blockchain the information of the fake thing? We check the serial number, and if the product is fake, it won't exist on the blockchain. So, I don't see it as a reasonable action for a counterfeiter to put the information in the NFT, it would be even worse, they would get caught even. So, it's really challenging for them to scan it because it's traced. Even if you scam on NFTs, what are you going to do with the physical product? They will keep on selling by hand.

Alba Figueras De La Parte: Blockchain is also a big investment. So, it doesn't seem realistic.

Juliette Herinckx: Then if every single product ends up on the blockchain, could it be the end of counterfeiting?

Ataman Ersan: Yeah, I think so. You would get instantly caught putting fake information on the blockchain. But now it still takes a lot of time even to get the crypto, it's not that advanced. If NFTs and cryptos are way more accessible in 10 years' time, scammers might go into it. But at the moment, no.

Alba Figueras De La Parte: Yes, but it's cohesive that it helps protecting against counterfeits at the moment, it helps protect the market.

Juliette Herinckx: Are authorities collaborating on the protection?

Ataman Ersan: When you say authorities do you mean partnerships? We are partnering with a blockchain technology company which is called LuxoChain, they're providing us the blockchain domain, which is very expensive.

Juliette Herinckx: If you catch a fake, do you collaborate with the E.U. or something?

Alba Figueras De La Parte: No, at the moment we keep the fakes here in our office. It's a good way to realise how a counterfeit is made, because some of them are really good. It's easy to get fooled. So, we keep them and study them. We try and find out where they're coming from, where they're being sold, etc. Because a lot of counterfeits we have here we bought from Vinted or Depop. To see how our competitors in our market are doing.

Juliette Herinckx: So, these fakes are directly sold on these platforms?

Alba Figueras De La Parte: Exactly, there's a lot of counterfeits on these platforms. Depop and Vinted are full of them. We are also learning how these people are not, I insist on not, controlling the market. They open the doors for people to sell fakes on their platforms. I bought a fake from Vinted, and the girl that sold it still has an account.

Ataman Ersan: This is not just a comment for our business, but from a customer point of view, we experienced it. It's a critic to the counterfeit circulation in the market.

Alba Figueras De La Parte: At the same time, Depop is incredible, you can find amazing things, Vinted too. But they're not protecting luxury. We work hard on that with our partners, to find the best and fastest solutions. Because that market is super big and is not protected.

Ataman Ersan: There is a lack of this protection which keeps allowing counterfeits to be produced and to circulate to the customer.

Juliette Herinckx: Thank you so much for the information!

Ataman Ersan: We would love to see the results of your research afterwards.

Juliette Herinckx: Absolutely, I will send you the results!

9.7.5. Interview with Angela Cearn (CEO at TrueTwins)

Juliette Herinckx: So maybe first you can tell us your name, what you do, what led you to work in the blockchain luxury industry?

Angela Cearn: Sure! I'm Angela Cearn, I was the CEO of TrueTwins, the company has been acquired by a private equity and digital agency in Copenhagen called STRØM WORKS and I just finished my transition. So, my biography, my career history is all public domain, so I'm sure that you can read it up online, and I can also send you a very simple brief bio afterwards. So, I'm not going to go into details here, but what led me into blockchain is I'm always interested in new technologies and innovation. So, I come from Silicon Valley, where a lot of the innovation happens, but the usage of the innovations is often led by the rest of the world. And blockchain outside of bitcoins and financials and Dogecoins has not seen a very prevalent use in other industry, even though the thesis of proposing it in various industry has been there for, you know, since the beginning. Everybody's trying to figure out how to leverage that and so when I was living in London, England and when I met this group of people who have been trying to leverage blockchain and bitcoin in the luxury industry, I got interested in the space, and I said, why not.

Juliette Herinckx: Interesting! Can you tell us in general, what is the potential of blockchain in the luxury industry, on the supply chain side and after sales services and everything?

Angela Cearn: Yeah, I am sure you talked to a lot of experts in the fashion industry, and especially in Europe, Europe is definitely a lot more, I would say, environmental conscious. So, the beauty of blockchain is that it can really help the traceability of a product. In the financial world, reasons why bitcoin was popular was because you take away the traditional model where everything has to be verified by one centralised agency, like the Central Bank right, and everybody can tell hey is this real or not real. And so from a traceability perspective, we thought, a lot of industry things about that hey from the supply chain, right now, the whole supply chain is a black hole to people, there are a lot of claims, and so it is a technology that, in theory, can be used to provide transparency in the supply chain.

Juliette Herinckx: And technically, how does that happen, how do you link your product to a digital twin?

Angela Cearn: I think, maybe what I'm going to do is to give you another aspect of it before I answer that question because now we'll get into the how to. Within the fashion industry, one

of the things that I found very interesting is that in Europe there are a lot of conversations with blockchain and traceability, with a focus on the supply chain. In the US whenever you talk about the product and the traceability, the conversation led more to authenticity. I mean in both places they can appreciate the focus of both transparency in traceability and authenticity, but you do see a little bit more of a focus in Europe on traceability of transparency, and in the United States there's a little bit more focus on the business case related to authenticity. So, the focus is a little bit different.

Juliette Herinckx: And where do you see the most potential? Traceability or authenticity?

Angela Cearn: I would say it depends on the company and the purpose. Also, in the boardroom or in execution, you know. If the purpose is for transparency, I think that the organisation focus will be on sustainability and how do you tie that to the actual reduction in greenhouse gases and how does it support the environmental goal, and that is very much a conversation that I see happening in every board room. So, in the company's boardroom, the conversation is about transparency and traceability. Often when you look at the execution, the floor, when they actually have to convert it to business case and especially as companies, you have to answer to wall street on the stock price, on the performance, I often see that the focus ends up being on the authenticity side, how does it save companies from revenue loss from counterfeit. So, what I see is still a need for a lot more linkage between the intention of the board members and the boardroom coming from an angle of what we call ESG, and how does it translate to the people in the shop from an execution perspective.

Juliette Herinckx: Then maybe going back to the how, how does that happen, how do you make it fully transparent and link that physical product to the digital world?

Angela Cearn: So, the physical product is difficult. Physical product means that you need to have some form of technology embedded within the product itself before you can attach the digital properties and digital traceability. And I'm sure with your other interviews you talked about a lot of different ways of doing it, and maybe I can up level you to give you the context on the way to approach it. Because every company has a different solution and that solution, they often call it as a proprietary because they develop it in-house. And I'm sure you might hear it from Aura and other of the big names, or even in the university when you do research, and the number one approach is really you need to figure out a way to identify that physical product and you need to be willing to identify that with two products being produced at the same time, in the same place, using the same by and large material, and what is the physical identity that

you can use to differentiate it. There is research related to looking at ‘it is an organic product’, for example, they’re often DNAs that you can get deeper into, and you can figure out if there’s a technology that you can expose to identify that DNA like whether it’s a strawberry or a pumpkin you know there’s fibres right, just like you and I often have some sort of footprint. So, on physical products, there has been technologies that investigate ‘is there a certain part related to the ink that we can apply to a product that identify the physical fingerprint of the product’. That’s one approach, there’s obviously pros and cons right, and so the other approaches are ‘What can I create as a company as a proprietary technology that I embed into the product’, and this could be a little digital device that only you (the company) can also produce the device to read it. And then the third... I would say currently a lot of companies are looking into QR codes and then NFC and RFID, it is a technology that has existed for a long time and it’s getting popular now in the last few years in the physical world, I would say primarily not to use for traceability, but primarily use for inventory control and checkouts. So can you leverage this, to enhance what those technologies can do and provide a blockchain traceability, leveraging more of an accepted and well-known technology service. Those are the three approaches.

Juliette Herinckx: Yeah, because it has to be unique as well right, if you want it to be associated with one buyer, it has to be different for each item.

Angela Cearnis: Yeah, the difficulty with a lot of the QR codes and the NFC chips that companies are implementing right now is, because their initial intention was to provide inventory control and expedite the check-out process, again it’s very execution at the floor level, on the shop level, how do I expedite that so I can reduce labour costs in the checkout and time. Those QR codes and NFC chips that are being embedded into the product differentiate skews, they are not differentiating individual products within the skew. So, for you to apply it for traceability, you have to then go back to see how do I identify each individual product within the skew. Otherwise, I guess you can do it as an intermediate level in terms of confidence, you know I’m pretty sure that this is real, but you can’t get into the identification of the individual products.

Juliette Herinckx: And then if it’s not unique what about the counterfeiters, they could just buy the real product and then copy the code?

Angela Cearnis: The thing about using blockchain technology and traceability is it also requires a lot of discipline. And having the discipline for all the different players in different parts of

the supply chain, as well as the commerce, as well as the post transaction and users to also follow the same process and understand the value that you create and the value of this traceability and to continue to honour it. And that's why I would say that you see the blockchain hype happen a lot more in the digital world, I think people are more likely to want to get engaged and to adopt that technology in the digital world rather than the physical world. It happens, but I would say you're going to see it a lot slower than the digital world. And not just for coins and financials but also for prints and pictures. If my prediction is correct, you're going to see a lot of luxury brands while they try to popularise the practice in the physical world, my prediction is that you will see them introducing more NFT of the images of the product and the promotional product or even in Metaverse right, in the virtual reality world and applying that NFT to that space. That will happen a lot faster, I would say, and a lot more profitable, while they figure out what to do in the physical world.

Juliette Herinckx: Because it's less costly I guess to just make NFTs.

Angela Cearn: Is that what you're seeing?

Juliette Herinckx: I mean in the articles and stuff you can see that the trend is more in the digital space, even Aura is using the platform for NFTs as well, so it's not just physical.

Rosalie Ghislain: Aura also calls the digital twin from the physical product an NFT.

Juliette Herinckx: We also interviewed a second-hand online platform and they're selling vintage products linked to an NFT, so you have both the ownership of the digital item and the physical one. It's kind of a mix of both I guess.

Angela Cearn: Yeah, um I would challenge you to think about it, because this is your master's thesis and the academic world. There is a different value to NFT and really what the intention of the physical traceability is. In the case of... yes, you can use the term NFT, and I do think that you explained it and you understand why right, but whether you're calling it an NFT or not an NFT, there is still a very strong potential breakage between the two, you can still lose the physical product and still own the digital copyrights of that image, right. And somebody can still find ways to hack it. And how do you prove that that NFT is still... you can say hey, this is an NFT because I have been tracing it right. But at the end of the day, what is the value of a digital NFT if you don't have a physical product. Versus someone who legitimately has the real physical product but somehow because of whatever hacker breakage right, even in a

theft case or in the case where you just lost trace of it, that you actually do own the physical product, how do you prove it?

Juliette Herinckx: That maybe brings us to how the blockchain works as well, would it be more of a private or public platform owned by brands? What is the best way to look at it?

Angela Cearns: I would say it really... Every brand should look at it, depending on how you want to approach it. Technology is often changing, and right now I'm sure in your thesis you're going to do a lot of research on what is the advantage and disadvantage of a private and public blockchain technology. I do think that public blockchain where you require a lot of voting, it is a very resource intensive solution and technology, and if your goal is to save the planet, public blockchain technology is an aspect that is counter that sustainability goal. And this is why sustainability is different because saving the climate has a big macro impact that often time you do one thing on one end, unless you look at the impact on our environment and all aspects of it, it's hard to calculate that actual benefit. Because you can do something really good on one side that leverages a technology that is bad for the environment on the other side, and it is not an easy way to quantify and calculate that. I do think that in the luxury world, if the initiator is the brand themselves using a private blockchain technology is a lot friendlier to the environment. But I like the public blockchain concept, because at the end of the day, the industry is composed of many different players. If you can get all the different players in the industry to participate, that in itself, whether it is the supply chain, whether it is a very, very tiny supplier in Portugal as well as a very small family of craftsmen in Italy to work together to support this traceability and they don't need to know each other, and then the public blockchain has a better technology, infrastructure to support the interoperability and collaboration of the different players, and that in itself is the whole thesis of blockchain technology. But unless you can get all these different players to do... if your introduction or your proof of concept of your pilot is really controlled by one brand and they have visibility and they want to expose only that commerce level of the traceability, I think, having a private blockchain network is completely viable also.

Juliette Herinckx: What about from a second-hand perspective? How would second-hand platforms be included in the blockchain?

Angela Cearns: The second-hand platforms... I am hoping that they will, I am foreseeing that they will always partner with the original brand. And it is the technology thing, you can sit in different types of technology and there's always a way to link them together. And the

technology is less important than the willingness of the people and the brands and the industry to collaborate. If the brands and the second-hand industry are willing to work together, they can connect to different private networks together or they can both participate in the public network. So again, I would say, not looking at it from technology solving the solution, technology is an enabler and the brands themselves need to want to solve the problem with the second-hand market and unfortunately, I think, right now, you will see that a lot of the brands are not the biggest player in the second-hand market.

Juliette Herinckx: Do you think that would change with blockchain, maybe brands taking advantage of the technology to sell their products once again?

Angela Cearn: I do, I do think that will change, I do know that a lot of the luxury brands that I worked with and I talked to are seriously looking at that space right now. I think, with the introduction of the NFT, I still think that brands will go that way first and then take the second-hand product, the physical product, I think they need to see the financial value of the NFT, of the digital world first, and they will likely use it for the vintage products first, or one of a kind products that they participated in proving the authenticity of, that's how they going to go about it.

Juliette Herinckx: Yeah, I think Gucci is already doing it, they have a website just for second-hand right now.

Angela Cearn: Yeah, most of the brands, you will hear that that they're doing it, I would say that right now, they're definitely seeing the sales growth there. But they're not as big as the third-party marketplaces right and just because third-party marketplaces for users, like me, I can shop for all the different brands and not just one brand. And frankly, right now, the price point is also better.

Rosalie Ghislain: And if luxury brands partner with the online marketplaces, how do you think they would give access to the blockchain? Via an app or directly, I don't know if it's like Vestiaire Collective, for example, like, how will the sellers and buyers will see it is part of the blockchain?

Angela Cearn: You can do both, you can go to... I'm assuming there's a physical connection, so you have to explain to the customers how to do it. We live in a world where people are pretty open with apps. So, you can definitely create an app for that, but I personally think that an app is something that you need to interact with often, so if there's a need for you to interact with

the NFT and the product often. And who's going to do it... it's really whether it is an app or something that you can use a different device or on the web, it's less of a... I would say it's a secondary question really and it's really about how you want to use it and how often do you want to use it and how did you teach your customer to use it.

Juliette Herinckx: But if you buy a second-hand product online, for example, how does the buyer check that it is on the blockchain like there might be a blockchain certified label online, but you cannot have that physical link.

Angela Cearn: Yeah, you know, and it is an operational practice right, and I think this is where the partnership with a real brand can... you have to be able to get some sort of digit code that is not public right, and so I'll give you perhaps a model. When I buy something, before my credit card gets charged, after I purchase it or even in part of the evaluation, you will send me a specific code that is encrypted just for me, and then, if I were going to go verify that code with Gucci and Gucci will then verify that yes, this is something that is in their blockchain network or whoever that is authorised in the network. And that code can change, if I decide that I don't want to buy it, I can't take that code and say hey now I owned it right. From a technology perspective, there are many different ways to make that happen, so that you can make that code activate itself, so to speak, to the actual buyer. If I didn't end up buying it, someone else has the code and actually purchases the product and that becomes activated within the Aura network or within the private network of the brand.

Rosalie Ghislain: And do you think this could also be automated by smart contracts directly into the second-hand platform or website? You shouldn't receive the code, but it automatically says that it is part of the blockchain?

Angela Cearn: Yeah, you can do that yeah.

Juliette Herinckx: Would brands be willing to collaborate on a single blockchain platform, or are they going in different directions, each developing their own?

Angela Cearn: This is something that I believe, with all the interviewers that you have access to do your thesis, you will have much better answers for that and I'd like to read your thesis, to see what your conclusion is. But I can give you an opinion, as a consumer, to really see this technology take flight like the bitcoin I do think that it needs to be a collaboration. But at the same time because that is the power of blockchain, it's the ability to collaborate between a wide variety of users and actors and of different areas to initially maybe competitors that don't trust

themselves right, so I do think that for this to become widely used as a scalable ‘everybody adopted’ way, but I don't think it is just one platform take all. But I also don't think it's every brand has their own platform, there might ultimately be two or three big blockchain platforms owned by the two or three big luxury brands conglomerates who have the financial power to develop them. And they may ultimately talk to each other, but I do not think that it needs to be owned by one platform, all you need to do is to look at the financial bitcoin space, there are many different types of platforms that support bitcoin, bitcoin is only one platform and even if you look at the blockchain technology, that collaboration technology is not only one of many, but different people are developing their own infrastructure and technologies so to speak, so my prediction is that you will see a handful, two or three, three or four, they would likely be aligned with fashion house conglomerates. I would have loved to see a public one for the smaller brands to get on, or I would expect that even the big brand blockchain networks, they would invite the smaller brands and the newcomers, even for the brands that they don't own and so that's what I would think.

Juliette Herinckx: Isn't Arianee public? Because right now the two big players, which are coming out of this are Aura and Arianee. Like one public, one private, so it's interesting to see which brand wants to go for which platform. Then what do you think of products which are centuries old and maybe have the most value, where are their space in the blockchain? Do you have to go back and find them and implement that identity on them?

Angela Cearns: I do think this is where the brand themselves play a very important role, this is where I do believe they're going to leverage the digital NFTs and, ultimately, for a product that is vintage just used by the Queen, you know, or Grace Kelly, is that whoever has purchased that product, they would likely insure it, and they would likely need to take it back to the brand itself and the brand itself really needs to say yes, this is a product, and from this point on, I have verified it, and this is all the history, and this is the connection with the NFT, and I will associate my digital NFT with this particular physical product and from now on, can you do the tracking. So, for product vintage high value product like this, I don't see a true authenticity without having the brand itself to prove it first, somehow they have to inject their experts' stamp of approval to really give the value. Now that is different from whether people will buy it right, people may still buy it from eBay or from Vestiaire Collective for hundreds of thousands of dollars, believing that, without having the brand's stamp of approval. There's a difference between the consumer demand and what the consumers feel comfortable with, but my opinion is that it really only has real value after the brand provides that stamp of approval.

Juliette Herinckx: And what is the role of external authenticators in that? Will blockchain kill their job?

Angela Cearn: No, no, because if you look at a lot of external authenticators, there is another pool of experts that the brand can leverage. Instead of killing the job, I can see the brand leveraging them and certifying them, and again it's up to whether the brand wants or feel comfortable in doing that and how many external authenticators do they trust, at the end of the day, blockchain is a trusted network, and when you connect it to the physical world, you have to have the physical trust first, and are they part of what Gucci and LV authorised and certified.

Juliette Herinckx: I don't know if you know much about this, but how are the regulations around counterfeits today, do you think public institutions are doing enough to stop them? Would blockchain help them as well?

Angela Cearn: I think blockchain helps consumers, I don't think blockchain helps regulators, at least at this point. I think the theory, again, I think, real life will take some time to catch up to the theory and I am very interested in watching this industry in the next decade, because I think if anything is going to happen, all the proofs of the physical benefits of this technology in this space, you will likely not see in a year or two, but you will see it in a decade, if it is truly viable. And I think that if you don't see it in this first decade, one or two things will happen and one is that it can always take more time, but the reality is some other, more scalable technology may be introduced to this world that companies find that it will be a lot easier, maybe completely different technologies that can be applied in this space a lot faster. So, from a regulations perspective, counterfeit is something that regulators have enough policies and have enough rules to fight it and the brands have fought it and it is sometimes... I hate to see it for brands, it is almost introduction to the new real product, you know for people who can't afford it, that they're using it, and the dream is when they own the real thing. And it's almost like a step training ground for a lot of the next generation customers, so I think that the brand cares about it, but at the same time, they also understand that it often is a necessary evil.

Juliette Herinckx: Yeah, it's only just a small part of people thinking they're buying the real thing and then it ends up being fake. And how would like blockchain platforms be regulated, do you think it would become mandatory, for example, for every brand to place their product products on a platform?

Angela Cearn: No, I do not think that will be mandatory. Perhaps, again, this is where your geopolitical policies and ideology will come into place, and so I do think that this is something

more on a macro aspect, there has been a lot of talks for sustainability we need the brands to prove that traceability and perhaps this is where your question comes from in terms of sustainability, but my personal belief is, let's face it, regulations and policies are always a slower than the market, that's how I see it. How long has it taken the governance around the world to place regulation on the Google of the world and the Facebook of the world. So, I don't think... I think that, at least in North America, there is this tremendous believe of freedom and let the economy and the market and the demand, the supply to drive what is needed. And that's why I see from an authenticity perspective, I do not think that the regulation and the policies is what would be driving adoption, because of the choice and the freedom to how do you create the product. I do think that perhaps in Europe, there will be a testing ground in certain countries that regulation will be introduced, and the brand will use that as a pilot to understand how this regulation and how to incorporate this technology with this regulation and see how it impacts the business. It will really depend on the region and the country. Freedom is very highly valued here in the United States, there's a lot of debate in terms of regulations that the government plays, especially on a private business right.

Juliette Herinckx: Okay, then maybe one final question from my side. How is blockchain going to penetrate the market, how do you see it in 10 years' time?

Angela Cearn: I do think that you will see a much, much higher penetration on the digital NFT side, on the actual imagery, and that is going to be what drives the physical, I still think that the physical adoption will be a smaller subset of the digital side. I don't think you will see every product and every price point having the benefit to leverage this technology in the next 10 years, maybe longer, but I do think that there is a technology gap, we need to have that gap filled. When you have the gap filled, meaning that technology needs to be innovated first before you will see a mass adoption in the physical world.

Rosalie Ghislain: So, do you think that, right now, Aura is going to redirect towards NFTs?

Angela Cearn: Well, that is something that I will leave it for the Aura experts to share with you, this is purely my personal opinion on how I predict blockchain technologies will be used in the next 10 years in response to Juliette's question.

Juliette Herinckx: Okay that's it, except if you have any questions for us?

Angela Cearn: Well, thank you very much for this opportunity to get interviewed by you and very, very much good luck to your thesis!

9.7.6. Interview with Daniela Ott (Secretary General at Aura)

For confidentiality reasons, the access to this transcript requires authorisation from the authors.

Abstract: The luxury fashion industry's fight against counterfeiting has been going on for decades, with brands often spending their own resources to stop the distribution of fakes and reclaim deceived customers due to unsteady support from regulators globally. With the rise of the second-hand market and its online players, counterfeiters and owners of fakes have found new ways to make profit. In this research, blockchain is introduced as a potential solution to prove authenticity of luxury fashion goods and add trust to these marketplaces. A review of the existing literature and interviews are used to explore the views of the various stakeholders on the technology, its scalability and potential for standardisation. Four scenarios for the future of the market are constructed, resulting from the combination of the extremes of two selected uncertainty variables. This thesis ends with recommendations for each scenario, conclusions, limitations, and next steps for further research.

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