

**UNIVERSITÀ DEGLI STUDI DI PADOVA**

**DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI**  
**“M. FANNO”**

**CORSO DI LAUREA IN BUSINESS ADMINISTRATION**

**TESI DI LAUREA**

**“INEFFICIENCIES IN DIGITAL ADVERTISING: BLOCKCHAIN AS A  
FINAL SOLUTION? THE HABITS CASE”**

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**ANNO ACCADEMICO 2019 – 2020**



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Firma dello studente \_\_\_\_\_

*Ai tecnologici di casa.*

## Ringraziamenti

Ringraziare deriva da “grazie”, una piccola e semplice parola che racchiude un enorme significato e quando pronunciata, anche di fronte al più semplice dei gesti, vi si associa un immenso valore. Proprio in considerazione di ciò, vorrei procedere brevemente a ringraziare coloro che mi hanno supportato e sopportato durante tutti questi anni, facendomi diventare la persona che sono oggi.

Sicuramente il mio più grande ringraziamento va alla mia famiglia, ai miei quattro saggi e i miei due zii che mi hanno sempre sostenuto e di certo sempre continueranno a farlo. Ulteriori ringraziamenti vanno a tutti i miei amici dell’Hescanas, i quali con gli anni mi hanno insegnato che l’amicizia è una medicina di vita. Un ringraziamento speciale va anche ai miei due Mômes, i quali mi hanno fatto capire che ci si può sentire a casa anche quando si è lontani più di 1000 km dalla propria città.

Infine, ma non per importanza, un doveroso ringraziamento va alla regina degli sport, la quale mi ha fatto capire che la perseveranza è una dote speciale e che mi ha donato una seconda famiglia ovunque ci fosse una pista. Per questo ci tengo a menzionare e ringraziare la Libertas Orvieto, gli amici del Campo scuola Renzo Corsi, quelli del Colbachini e infine i miei amici francesi dello stadio Jean-Pellez.

## **Abstract**

The following thesis analyzes how Blockchain technology could represent a means for efficiency issues that digital advertising is tackling, with a focus regarding the solutions implemented by the startup Habits. In particular, the thesis explores the main factors that currently are compromising the efficiency of digital advertising within the digital media supply chain, mostly for advertisers and publishers. Subsequently, an overview will be offered regarding the mechanisms of Blockchain technology in order to have the right keys to understand the solutions implemented by Habits, which wants to revolutionize fashion e-commerce through the introduction of its utility tokens (HBX). Finally, through a survey analysis addressed to market experts, the thesis highlights how the market analyzed still presents these inefficiencies and how the Blockchain could craft an alternative path for the market, managing to provide more efficiency than traditional channels.

Keywords: Digital advertising, inefficiencies, Blockchain, Habits.



# Table of Contents

<b>Introduction</b>	<b>8</b>
<b>Chapter 1 Digital marketing</b>	<b>11</b>
1.1. History and evolution of digital marketing	11
1.2. Digital advertising	17
1.3. Inefficiencies in digital advertising	21
1.3.1. Advertising fraud	22
1.3.2. Transparency	26
1.3.3. Intermediaries	29
1.3.4. Ad effect measurement	32
<b>Chapter 2 Blockchain technology</b>	<b>35</b>
2.1. A brief history of Bitcoin and Blockchain	35
2.1.1. What is Blockchain	37
2.2. Peculiar functions and properties	44
2.3. Coins, tokens and fundraising mechanisms	52
2.4. Applications	61
<b>Chapter 3 Case study</b>	<b>69</b>
3.1. Habits: a brief introduction	69
3.2. AR, tokens and solutions	74
3.3. Data analysis	85
<b>Conclusions and future developments</b>	<b>93</b>
<b>References</b>	<b>96</b>



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## Introduction

*“We went from being the Flintstones to the Jetsons in 9 months.”* — Dan Schulman, CEO PayPal

I strongly wanted to start with this quote because, in my opinion, Dan Schulman managed perfectly and ironically to summarize in a short sentence one of the most complex phenomena that is transforming our lives, where a business model can become obsolete just in a couple of weeks. Nowadays, the communication field is at the centre of a revolution that is shaping constantly, each day, the way through which people interact with others, with which they come into contact through information and news; a change that is figuratively burning the traditional paradigm and boundaries of the communication. Certainly, the digital is leaving one of the main footprint along all the process and mostly companies are subject to this sudden change, the latter one involve the entire area of communication.

The New Economy, given the sudden evolution of the technological tools made available by the market, is part of a dynamic and constantly changing scenery. It highlights the definitive overcoming of the Old Economy and the transition to a corporate structure that is no longer identified within the traditional canons of a physical place where the business is carried out, but organized in a virtual place. The latter is “undocked” from the concept of a productive building or industrial being able thus, to offer to the market quick answers at any time and to provide services through the use of ICT. Probably, within the company’s environment the most affected area is marketing, where the wind of change triggered by digital has allowed organizations to have new spaces and tools for attaining and hitting the attention of the surrounding environment.

Within this new context it became clear, how along the marketing area the importance of digital advertising is thriving and how it would be reductive to conceive online advertising as the merely digital transition of the strategies and communication methods that had oriented

companies in traditional advertising. Digital advertising is considered as a fundamental part of any marketing strategy, therefore is a shared opinion that money invested in digital ads worth each euro.

However, during the last years the transparency of the industry has been questioned by a lot of factors, highlighted mainly in 2016 by a phenomenon that affected the profitability of companies, spending their budget on digital advertising, namely: adfraud. This fraud has been defined as the Century's fraud, a system that relies on using a huge computer network (bot) programmed to simulate a human behavior surfing online. From this episode is clear how some phenomenons have shaped the trust of the entire ecosystem within the industry, hence actors have lost some of the trust regarding the digital advertising process due to a lack of a proper transparency. These problems have also brought to light a whole series of problems related to inefficiencies in digital advertising. As a matter of fact, in the last period, companies are becoming aware of these problems and are looking for solutions to solve them. A possible solution is offered by the implementation and integration of normal advertising activities with a system that, by definition, doesn't need trust between users and in which transparency is one of the fundamental pillar, namely: the Blockchain.

The Blockchain has acquired particular notoriety thanks to Bitcoin, a payment system based on a digital currency that has precisely exploited the Blockchain technology to create the first cryptocurrency in the world. Everything started in 2008 when Satoshi Nakamoto, a pseudonym which identity currently is still unknown, published a white paper called "*Bitcoin: A Peer-to-Peer Electronic Cash System*". Within the white paper, the author/authors in only 9 pages introduced "...a system for electronic transactions without relying on trust...a peer-to-peer network using proof-of-work to record a public history of transactions..." (Nakamoto, 2008). From the document, clearly transpires the will to present to the world a technological revolution that has the potential to impact, in a disruptive way, the traditional human beings' habits and boundaries. A platform of innovation that gives new answers to a heterogeneous variety of needs that come from companies, consumers, organizations and individuals.

We can define and classify this as a peculiar technological innovation because, differently from others, combine and put at the center of the focus a melting pot of concepts and topics

that usually differs from each others. Some of the concepts and topics covered are: decentralizations, trust, community, transparency, security, immutability, they are all part of a receipt “untraditional” for a digital innovation. This new means has the capacity to potentially eliminate any transaction costs occurring in any market transaction, therefore during the last years, the Blockchain has been the protagonist of a series of attentions from individuals, governments and firms due to this ability to cut off any third party that works as intermediary. Taking into account all this basic information, it’s very easy to understand what is the direction that Blockchain wants to “dig”: a *trustless* system, that many defines even a “world”, in which nobody has to trust others for any kind of operations, because every transaction is open for anyone and everyone to see and managed by the system itself. However, the big questions that some companies and users are wondering is: Does the Blockchain incorporate enough potential to revolutionize the digital advertising system by creating a final solution to fix the current inefficiencies?

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# Chapter 1 Digital marketing

## 1.1. History and evolution of digital marketing

Marketing during the years changed the channels through which companies can implement their strategies, obviously the final aim is remained the same, that is to communicate value to the customers, however marketing has followed some peculiar steps in order to reach what today we call digital marketing. In this sense, in my opinion is important to retrace what have been the distinctive years that have characterized this process summarizing briefly a timeline.

All started in 1990, when Archie, the first search engine was created and the term "digital marketing" was first used (Kingsnorth, 2016), in particular the spread of this term has been supported by Web 1.0, however this version was strictly static in the sense that users could get an information by the web, but they couldn't share the latter on the web.

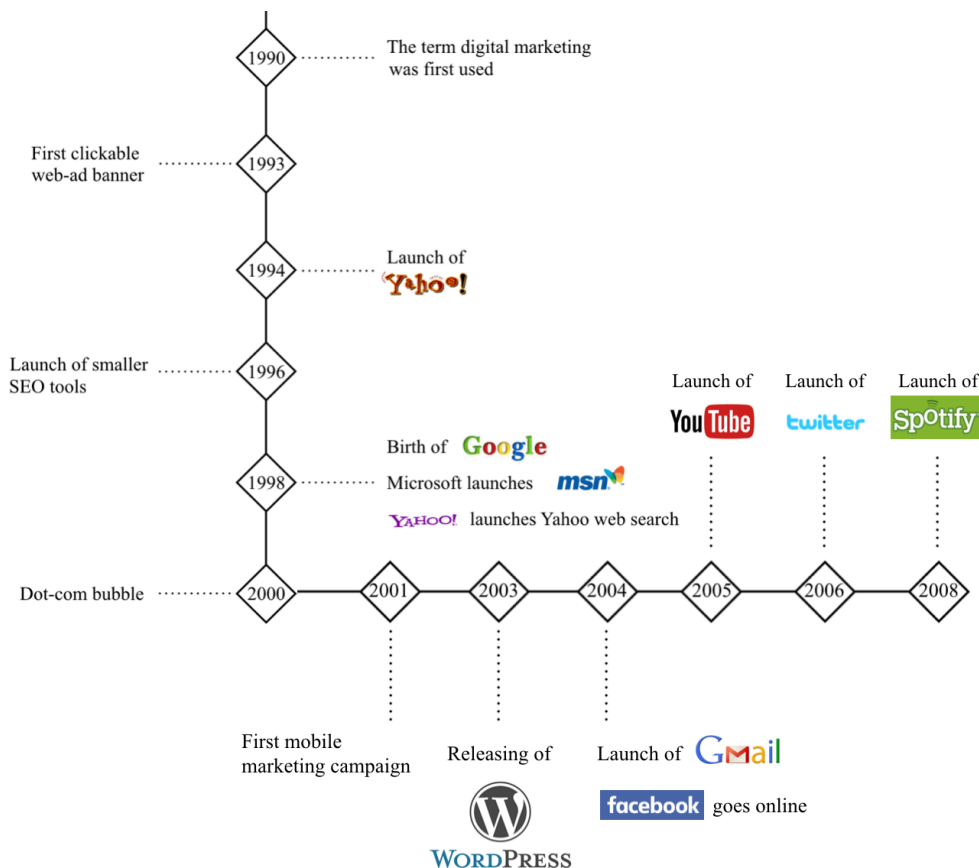
In the 1993 the first clickable web ad was sold and this has triggered the development and creation of its own reference market for online advertising spaces, subsequently called "banner ads". The year after, in January of 1994 Yahoo was founded and in the same period the first web crawler, called Webcrawler was created. All this has triggered a phase that we can identify as the beginning of the Search Engine Optimization (SEO), which in 1996 led to the development of small SEO tools.

The 1998 was a very intense year from the point of view of digital launches and births. This year brought to light companies like Google, whereas Microsoft launches the msn messaging system on the market, while Yahoo creates Yahoo web search. A peculiar feature of this period is the growing presence on the market of countless companies focused on providing services via web, also known with the term "Dot-com". Basically they were companies that interfaced for the first time the global environment, for instance through channels dedicated to online sales (e-commerce) and, in particular, through the creation of web pages with the ".com" domain. The common principle that brought together all the first dot.com companies, apart

from being placed in a new context named New economy or called even Net Economy, is that they followed the so-called *get big fast* strategy.

The operative consequences of this logic were that the focus of the short / medium-term strategic objectives of these companies, was to look for the increasing of users in any possible way, even at the cost of facing significant losses. As history teaches, the speculative bubble traditionally explodes when a specific market is saturated, so basically when investors are no longer willing to use their funds to purchase something, whose price in the meantime has "inflated" by several factors including speculation. Indeed, with the begin of the new century, the bubble burst and as a consequence a lot of small search engine were shutted down.

However the following year, was one of the most iconic because the first mobile marketing campaign went online, more precisely the campaign was launched by Universal Music and was based on SMS. Another iconic date was the released of WordPress on 2003, followed in 2004 by Gmail, Facebook, where in the same year Google goes public. The last three main iconic years that marked the digital era of marketing as we know it today have been: the launch of YouTube in 2005, Twitter in 2006 and lastly Spotify in 2008.



*Fig.1 - Digital Marketing Timeline*

*Source: Personally designed Digital*

Marketing is one of those terms that is shrouded in confusion and seems to mean something different to everyone, it's also been made to seem way more complicated than it actually is, because at the really end is something really straightforward. As a matter of fact, we can simply define digital marketing as just marketing using digital tools, and marketing is nothing more than communicating value to customers and the surrounding environment. Obviously this typology of marketing differs with the traditional one mainly for the channels used, indeed as mentioned above the latter one is carried out mainly on paper, television and radio; whereas peculiar characteristics of the digital marketing is the integration of marketing with a widely number of digital tools.

The direct consequence of using digital tools, is that allows digital marketing to analyze in real time what is working and what is not within the communication strategy implemented and, differently from traditional marketing, provides the possibility of a continuous monitoring. In addition, there is the possibility of reaching potential customers targeted in specific geographical areas, in fact reaching the right target gives the possibility to create customized offers and therefore increasing the engagement with potential customers. Differently from other methodology of traditional marketing, the digital is characterized by low costs channels and a higher degree of targeting. Surely digital marketing is one of the method more efficient for increasing the visibility and the reputation of a company or brand, in this way even smaller companies have the possibility of interfacing with bigger and more important ecosystems.

Naturally this change of paradigm did not have only consequences on the supply side, but there have also been repercussions from the demand point of view. Today consumers can have access to information in every place and in every moment, as a consequence, theoretically the asymmetry information which previously was in favor of sellers, today no longer exists and there is a greater control and contractual power for buyers.

Nowadays, purchasers are more influenced from the perceived brand awareness and from reviews given by other consumers and as a consequence, from the reputation that the brand is able to attain within this digital environment, that is why social networks play such a fundamental role.

Therefore, in the new digital era is very relevant the set of values that the product or service is able to enclose, hence a great importance is exercised by social media that should be considered as a critical factor when a company implements its strategic plans. The set of tools and the activities utilized from companies for trying to “assign” values that could influence the final purchase decision are under the notion of branding, and the main channels through which companies can try to implement these strategies are those in which digital marketing is divided, the main categories are (Kingsnorth, 2016):

- SEM (SEO and SEA)
- E-mail Marketing
- Social Media Marketing
- Mobile Marketing
- Display Advertising

Even though there are also other disciplines such as content marketing, video marketing and inbound marketing, I believe that for my analysis is sufficient to know of their existence without going too deeply into certain aspects which go outside my research, therefore I will knowingly insert them between mobile and display advertising.

The *search engine marketing* (SEM) is a branch of digital marketing that indicates the set of processes that have place on search engines, in which the primary objective is that of increasing the qualified traffic within a specific web site, increasing therefore the traceability and visibility. The term qualified traffic usually refers to all visitors (users) whose interest is consistent with that of the content treated on the website. The SEM concept very often is perceived as dissociated from that of SEO thinking that are two channels completely at opposite poles, but actually is not.

If I had to explain with a mathematical formula the relationship between *search engine optimization* (SEM) and *search engine advertising* (SEA), I would summarize everything by using a simple equation:  $SEM = SEO + SEA$

The search engine optimization (SEO) is a discipline whose task is that of optimizing the ranking of a specific web site within the search engine through organic traffic, which is not paid. For doing that, the optimization is based on strategic plans for increasing the quality of web site contents, in fact the quality is just one of the main factors that search engines takes into account when they assess and rank a page. Obviously, at the really end at the core of the SEO, there is the optimization for the final user not for the search engine, even though one of the main indicator still remain the ranking.

Fig. 2 - Examples of ppc

The image shows a Google search interface with the query "rent a car". The search results display several paid advertisements (PPC) for car rental services. A red label "Examples of PPC" with arrows points to the first three ads. The first ad is from "www.agirent.it" for "Noleggio di auto furgoni". The second ad is from "welcome.ubeeqo.com/carsharing/milano" for "Rent a Car From 34€/day | 10€ Free with Code MILANO10". The third ad is from "www.rentalcars.com" for "Rentalcars.com: Noleggio Auto Low Cost, Confronta i Prezzi". Below the ads, there are search filters for "Di cosa ho bisogno per noleggiare un'auto?", "Che età devo avere per noleggiare un'auto?", and "Posso prenotare un'auto per conto di qualcun altro?". At the bottom, there is a rating of 4 stars based on 120,594 votes.

Source: Personally designed

On the other hand, there is the search engine advertising (SEA), which is a discipline that deals with increasing traffic on the web site for a fee through real forms of advertising.

Fundamentally, one of the main differences between the two is also the time span, as a matter of fact the SEA is focused on increasing the traffic on the short terms, inasmuch as we pay for a fixed time each click on the web site (ppc, pay per click). Whereas the SEO is more focused on improving and staying in a certain rank within a specific search engine providing to the user a pleasant web browsing experience, so having its focus more on sustainability in the



medium and long term. They are not mutually exclusive, but rather they must both be implemented in an organic and complementary way in order to conduct an effective online marketing plan.

The *email marketing* is a one of the channels from which digital marketing is divided, is a really direct form that use e-mail as a communication tool. This methodology provides more perks than the traditional paper mail, among the many, it allows to customize the message according to the recipient, going to create a "one to one" relationship with the potential customer and moreover, it is economically advantageous compared to the traditional form, being able to guarantee an instant tool and at the same time saving money.

The *social media marketing* is that part of digital marketing which deals with making companies or brands acquire notoriety through social networks, that we can define as virtual communities. The social phenomenon has gained notoriety since 2003 with the launch of Friendster, the first social network in America, then has exploded with Myspace and subsequently, as we have previously seen, with "The Facebook". Nowadays, the online presence of social network is stronger than never, there are a lot of platforms that can be exploited by companies in order to make their voice heard in the midst of such a chaotic environment. Currently, the main platforms are represented by:

- Facebook
- Instagram
- Snapchat
- Twitter
- YouTube
- LinkedIn
- Pinterest
- TikTok

There are even other platforms provided by the market through which companies can interact with potential customers but these are the principal, and in contrast to what is commonly thought, firms do not need to own a profile in each of this platform.

A company has to strategically think about which platforms better integrate with the needs of the firm's vision, culture and mission; the choice on how to interact with the chosen channel is a fundamental point.

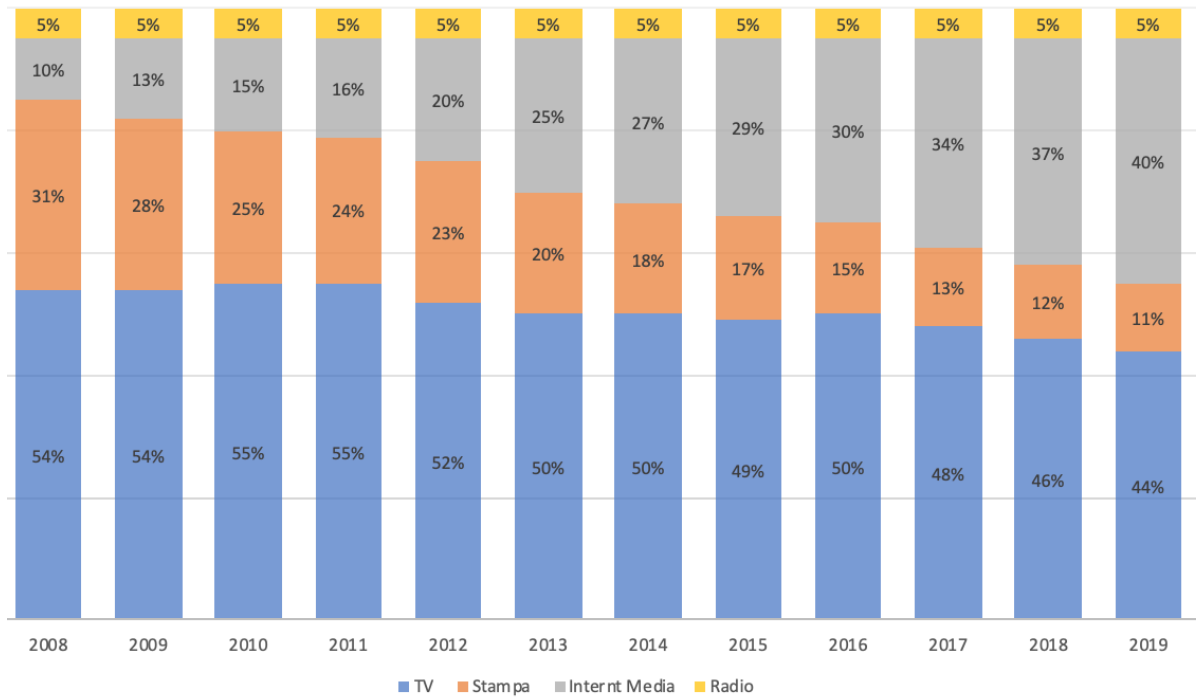
The *mobile marketing* is a sub-activity of digital marketing focused on promotional activities aimed exclusively at mobile media, such as smartphones and tablets. During the years this channel has become increasingly used thanks to the increasing presence of these devices in our lives. Today, however, the trend has moved on the use of mobile apps, which are now the fundamental tool for organizing the use of smartphones. The activities carried out in this sub-dimension of digital marketing now focus more on mobile properties, and more specifically on mobile-sites and apps. Nowadays, companies that have developed their own apps are on the agenda, is the signal that the market is moving to ensure that these, thanks to their increasingly multiple and innovative features, offer the user a unique user experience.

Lastly, there is the *display advertising* which is one of the principal methodology used within digital marketing for advertise which consists on placing, in specific paid spaces (sites, apps, blogs, etc...), ads in order to promote a service / product. There are several tools through which this methodology can be exploited, the important step from a company point of view is to choose carefully the specific site, app or blog where the advertising campaign will be placed, in order to be in line with the programmed objectives.

## 1.2. Digital advertising

Moving from the digital marketing to the digital advertising, which is a sub category of the former category, it must be righted how the advertising market has always been dominated by television which currently remains the fundamental pillar that supports the entire structure. However, over the last decade a clear trend has strongly emerged and which can be deduced from the graph below.

Fig. 3 - Italian advertising market breakdown

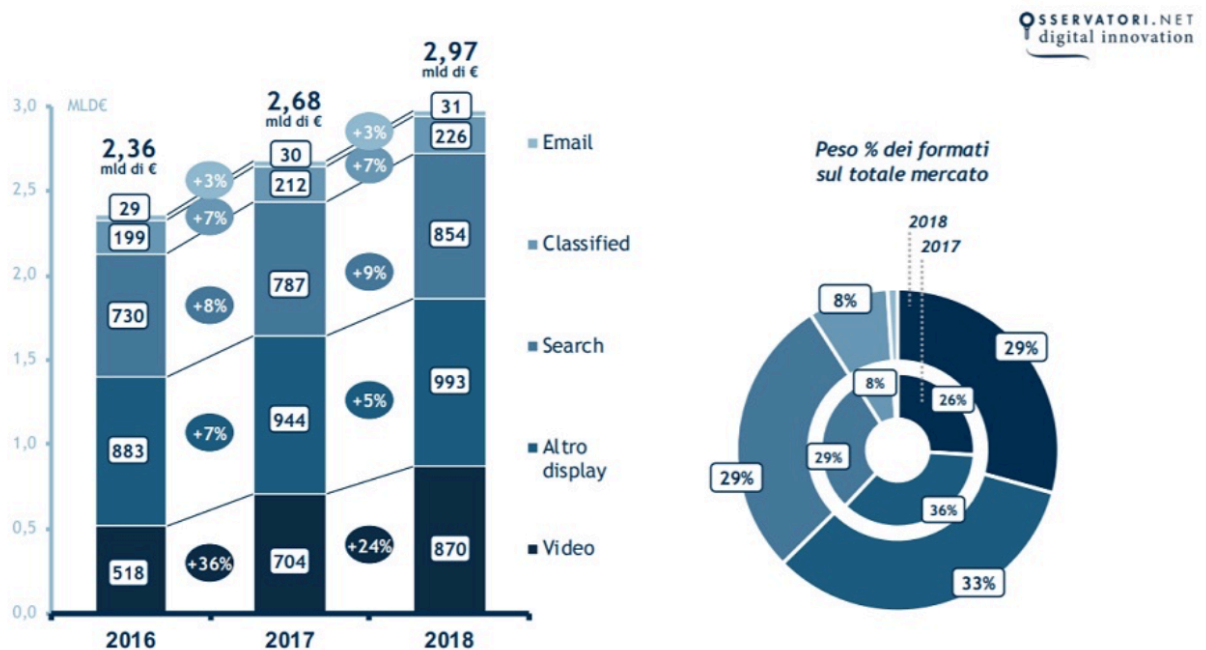


Source: Osservatore internet media

As we can observe from the Italian advertising market breakdown, the trend highlighted in the advertising market is the increasingly use of internet media tools, as a matter of fact they have become the undisputed protagonists in the increase market share. While investments in communication tools such as radio and TV remain more or less identical, the graph clearly highlights a constant decrease, year after year, of print advertising which gives way to new technologies. Even though above we said that TV channel is still the great pillar that sustains the entire market, there is a clarification that must be done before we go further. What the graph analyzes is just the Italian situation about the different advertising channels used, however in other Countries, TV channel has already been surpassed by digital advertising, a great example of this change is represented by United States of America. Obviously, the global trend is roughly the same, but some Countries have already reached a breaking point regarding the traditional advertising conception. Nevertheless, also Countries like Italy are following this path, indeed internet media candle highlighted in the graph is growing faster than the other channels do, and very soon is going to surpass the old load-bearing wall.

In support of these statements according to Osservatori internet media in 2018, the weight attributable to the expenditure in digital advertising in Italy reached 2,97 billion euros, emphasizing once again the clear upward trend of the digital tools.

Fig. 4 - Evolution of digital advertising spending 2016-2018



Source: Osservatori internet media

As we can observe from the histogram, the majority of the investments in digital advertising are represented by display advertising, as already discussed before it is one of the main, if not the most important used today. This sub-dimension of digital marketing in turn is divided into 4 main categories (Kingsnorth, 2016):

- *Rich media* - are complex ads that not only incorporate images and text inside, but also audio and / or video; they can be expandable and / or mobile to try to obtain the highest interaction with the users, examples of this category are mini video games.
- *Banner* - they are perhaps the most used category ever when resorting to digital advertising. They are essentially image-based which can be of various sizes and which are inserted by advertisers to capture attention on the ads.

- *Pop-up or pop-under*: they are dialog boxes that appear when you open certain sites but with a smaller size than the latter one and the name differ according to whether they appear above or below the screen. Their function is the same as the other categories, but they are much more invasive.
- *Interstitial*: as in the previous case it is a very invasive tool, however the main difference from the pop-up or pop-under is that, the screen that comes out, consists of a full-screen web pages.

These 4 major categories have two other dimensions depending on the channel used to purchase the spaces. As a matter of fact display advertising is further divided into two categories: non programmatic and programmatic advertising.

*Non programmatic advertising* or known also as *Direct Ad Serving*, refers to the negotiation regarding the purchase for advertising spaces through traditional channel, that basically are private negotiations through which publishers and advertisers reach an agreement. While, regarding the second type, *programmatic advertising* represents one of the most interesting phenomenon in recent years within the ecosystem of the online advertising market. This category is very wide and includes various types of purchase, but generally we can define programmatic as the purchase that takes place through an automatic mechanism to win spaces listed, the peculiar characteristic is that this process takes place in real time within automated platforms.

Through this particular methodology, the advertising spaces made available by the publishers are collected in software platforms called SSP (Supply Side Platform), whereas the insertion demands from advertisers, on the other hand, are collected in platforms called DSP (Demand Side Platform). The platforms that collect and order the relevant data for advertisers and publishers to optimize the way in which the ad units are purchased and sold are called DMP (Data Management Platform).

One of the type most used within this category is known under the name of Real Time Bidding (RTB), when a user enters the publisher's website, app or blog, an automated auction mechanism in real time is activated and managed by these platforms; these auctions take place

within a few milliseconds so that each space is assigned by relevant ads when the user accesses the website. Sometimes programmatic advertising is often associated to real-time bidding, the main difference lays in the fact that the RTB adds an auction element to some of those impressions (Kingsnorth, 2016). How can an advertiser or publisher participates in these particular auctions? Basically, each advertiser inserts inside his DSP some information including the budget and the target, and then uploads what will appear on the advertising spaces, such as banners and creativity. All DSPs are configured to look for the best opportunity in order to get the most efficient, important, and attractive advertising space, whereas SSPs are configured to look for the highest price. Offers continue to rise automatically until the DSP with the largest budget reaches the best offer. These auctions are concluded by assigning to advertisers the advertising spaces, according to the result of the match between supply and demand, so at the end of the auction the winning ads are published.

### 1.3. Inefficiencies in digital advertising

Bearing in mind the wideness of the digital advertising phenomenon, it is very easy to understand how this element has opened brand new paths to marketers. However, even if this phenomenon has allowed, is allowing and will certainly allow the development of multiple solutions in the future, nowadays this system is not yet perfect, as a matter of fact there are a lot of actors within the market which are complaining about some issues.

At the beginning actors were satisfied of the efficiency provided by the model, mainly because this is a model able to combine, from one side the excellent performances and on the other side the ease of use. A combination that is not that simple, but this is possible thanks to a model that does not involve a total immersion within the complexity that lurks behind the purchase mechanisms of digital advertising spaces. Nevertheless, the ease of use besides being a strength represents, at the same time, the biggest weakness of the overall system. This because the fact of not having the need of a full immersion within the advertising chain leaves room for inefficiencies that could arise during the process, hidden from steps not very clear for all the actors within the market. Therefore, the final goal of this paragraph is to analyze better what are the possible characteristics that may obstruct digital advertising markets from reaching their maximum allocative efficiency. In particular, the four main problems that the overall digital advertising market is tackling in terms of inefficiencies are(Gordon, 2020):

- Ad Fraud
- Transparency
- Intermediaries
- Ad effect measurement

According to the study conducted in the paper “inefficiencies in digital advertising market”, Among the majority of brand marketers interviewed, and more precisely 75%, stated the last one as the biggest threat for their digital advertising budget, with almost 70% of agency professionals reporting ad fraud as the leading threat (Gordon, 2020).

### ***1.3.1. Advertising fraud***

As discussed above, we have seen how digital advertising is becoming the main channel where marketing campaigns are placed, in particular programmatic advertising has become an essential element for those who work within the digital advertising market. Principally because, this new interesting buying and selling method offers a unique opportunity to increase the quality of communication, hitting precise targets, decrease dispersion and thus overall make marketing campaigns more efficient. However, hand in hand with this new increasingly phenomena there is something that is taking off too: advertising fraud or ad fraud.

Ad fraud is a collection of practices that misrepresent advertising inventory or disguise machines (bot) as humans in order to steal advertising expenditures. Most industry estimates , indicate that fraud takes 10-30% of total digital advertising revenue (Gordon, 2020). Advertising fraud is able to damage any type of advertising and directly damage both advertisers and publishers, hence losing in terms of finances and opportunities. Why does digital ad fraud exist? There are a lot of factor that influenced its existence, however the main reason lays in the fact that the programmatic advertising is an open ecosystem, which means that any advertiser or publisher can participate in the transactions. Nevertheless, being such a democratic system unfortunately creates opportunities for “bad guys” to enjoy the party too and gives them enough space for polluting the environment. The advertising fraud too often it is associated to the non human traffic, more precisely to what in technologic terminology is

called bot, which is a software that have access to the network through the same channels used by human users. These bots are tools and have a wide range of possible purposes, but usually are exploited for automation of tasks that would be too repetitive for human activity, for instance replying in a chat is the perfect example on how they are used. Nevertheless, within the ecosystem of advertising fraud, they are not the only method through which a fraud is implemented, as a matter of fact according to an interview to Paolo Serra which is a marketing technology expert, we can identify two principal characteristics:

- Non-human traffic
- Human traffic

Starting from non-human traffic category, it must be said that is mostly used to generate fake clicks and impression (page views). However, in some cases, depending on how they have been programmed, bots are also able to generate newsletter subscriptions, form submissions and more, therefore inflating the main indicators for evaluating a marketing campaign. Usually they are easy to identify, for instance they have a static IP, always the same user agent, cookie ID, etc.

However, during the years there have been developed more sophisticated versions that employ more complex tactics, such as user agent rotation, using random proxies (in order to change easily IP addresses), and in some cases are also able to reproduce real mouse movements, in this case detect and block them is a more complex job.

Finally, there is another subcategory called botnet, generally these are composed by a wide range of personal computers that have been infected by virus. Consequently, thanks to the virus they have control of countless personal computers, and botnets as in the previous case, are simply used for tasks like clicking on ads, generating impressions or altering the progress of the campaign, with a huge loss of money for the advertiser that is paying for nothing.

As a matter of fact, within non human traffic category, botnets are the most difficult system to detect and block, however they are also illegal and, consequently, more risky to use.

Regarding human traffic, giving the fact that are real users that are acting, detecting them is something more difficult because the users are real but clicks and impression represents a



fraud. For having a complete picture we have to take into account the fact that this last group is further divided into other sub categories, always according to Paolo Serra (2016), these are:

- *Cookie Stuffing* - also known as cookie dropping, this mechanism is a technique which involves setting one or more cookies from another site in the user's browser when visiting a page. It's very used mostly for maximizing revenue strategies regarding affiliate marketing.
- *Invisible ads* - in this case the method used is to hide the ads so that they fit the "zero chance of being seen" criterion by a human visitor, this technique is also known as impression stacking or even ad stacking, which basically hide other ads behind principal ads. Therefore when this method is implemented within a site the publisher is generating multiple impression for a single page view.
- *Ad Injection* - this method allows to fraudulent to add ads within a particular web page without having the permission from the publisher.
- *Click Farms* - like the name suggests, is a technique that exploit real users that are paid for clicking on banners, ads, and so on. Therefore inflating the results of advertising campaigns, effectively going to tamper all the main indicators assessed for a campaign.
- *Arbitrage* - in this case this definition is really close to that one derived in economics, basically brokers buy inventories from different publishers for a very low cost, often well in advance to avoid having competitors that would raise the price, and then sell it at a higher price. One example could be buying traffic from platforms like Facebook and then pour that traffic into another publisher network in order to create revenue.
- *Domain Spoofing* - this last method involves creating a web site trying to copy an original domain of a legitimate site, with the aim of obtaining sensitive information and deceive the user, usually the web site created uses a graphic very similar to the legitimate one and with a domain very close to the original one.

However the levels of fraud are not linear during the year, broadly speaking, fraud is invited whenever and wherever digital advertising demand outstrips supply (ANA, 2017). One of the main reason why this methods are so increasingly used is because the majority is not technically illegal, comparing this kind of fraud to other fraud, this is less risky and sometimes even more profitable.

It is very clear that at the centre of this fraud ecosystem one important role is played by publishers, obviously not all of them are fraudulent, but someone acquires fake traffic purposely, whereas others do it accidentally. Nevertheless, the fundamental question is: how it is possible that the system allows this manipulation? To answer properly to this question a reading key is needed, in order to understand what is at the basis of the problem, there is the need to investigate deeply on what is the role of the two ecosystem's central platforms that manage the entire market, both on the publisher side and on the advertiser side, namely: SSP and DSP.

In particular, if the fraudulent impression are multiplying through the transactions, the responsibility to tackle fraud falls also on the DSP side. Even though, the majority are up to the challenge, the reality is that it is an endless game. There are countless sites selling their inventory and it is almost impossible to check all of them.

Regarding the SSP, a publisher if wants to offer a space of its site, that in technical vocabulary is usually referred as inventory, must use an SSP. As a matter of fact, a publisher cannot sell its inventory in programmatic without using an SSP. Here is the one of the main conundrum concerning this side, why should a SSP platform allows to spread frauds within the ecosystem? The answer is not easy and is very likely that there are more than one reason to take into account, according to Paolo Serra, the most plausible answers is because in general, the SSP may simply not be aware of them, either because it is not sufficiently developed to look for frauds or because in some cases, as we explained before, is not easy to detect them. Therefore, the SSP very often is not able to verify the traffic sources of its publishers, so it is basically blind.

Within all these frauds one in particular has become particularly famous, in fact has been defined as the Century's fraud, a system that relies on using a huge computer network (bots) programmed to simulate a human behavior surfing online. The fraud is also known as Methbot, the latter has been discovered and analyzed by White Ops' experts, a company specialized in cyber security, in 2016. The data underlying to this fraud are staggering, in particular domains and URLs were falsified to deceive a massive numbers of advertiser, as a consequence fake ad impression were then generated on these domains using over 500 000 IP

addresses. Just to have an overview regarding the dimension of the problem, we can compare it in terms of financial damage, with two of the biggest fraud scandal in the history:

- Bernie Madoff's ponzi scheme, cheated his clients out of \$20B,
- Enron scandal was even three times worse of the latter, worthing for roughly \$63B,
- Ad fraud is not a one-time crime, according to WhiteOps's report accounted for \$7.2B in 2016 and \$6.5B in 2017.

Fortunately over time tools and strategies have been developed and deployed to face these fraudulent methods, however today this phenomenon still persist within the environment and have caused very serious damage to the ecosystem's transparency.

### ***1.3.2. Transparency***

*"Half the money I spend on advertising is wasted; the trouble is I don't know which half."*  
John Wanamaker (1838-1922)

Very often the situation which the advertiser faces within the digital media supply chain can be described as an incomplete contract and the main factor that prevent a complete contract in this case is known as asymmetric information. As the contract theory teach us, usually there is a lack of transparency when there is asymmetric information between two or more parties. In particular, the latter is defined as a condition in which one party has more or better information that does not disclose to the other party, and thus this creates a discrepancy between the two (Besanko, 2012).

Transparency in digital advertising is one of those topic that very often is not treated properly, but unfortunately underestimating it could result in enormous damage for companies and all the agents involved within the environment. This problem emerged very clearly in January 2017 when, Marc Pritchard CEO of the multinational Procter & Gamble (P&G), turned his attention to the unpleasant practices of advertising agencies after a very awful experience with an agency operating with the company (Handley, 2017). Only few months later the problem of transparency and brand safety linked to digital advertising emerged, especially when many of the big brands discovered that their advertising appeared on unwanted ad spaces. These are

not isolated examples but symptomatic cases of a problem currently endemic for the advertising environment. Budgets, metrics, processes and other commercial operations surrounding paid media campaigns are all too often characterized by lack of transparency. This lack of transparency has long been accepted as a status quo, companies have get used to a decrease in returns and a lack of clear direction in paid media campaigns, but nowadays things are a little bit different.

Companies have understood how transparency is something that can really help their business take off, therefore generally, they no longer accept the unclear situation and are trying to implemented methods and techniques in order to create a more clear and sustainable environment. One of the main benefits of having transparency as one of the main pillar in paid media, is a more defined strategy for companies. Indeed, having full visibility and full control over what happens in the campaigns, brands are able to adopt a strategic approach to their advertising that better fits their objectives. Obviously this has also a direct repercussion on the potential dimensions of the market, if brands are fully aware of the direction taken by their investments and the benefits obtained, they would be more willing and incentivized to increase them. Whereas, if the returns are reduced due to unknown factors, they would be motivated to suspend the investments toward an environment that is not really clear.

The Lucidity's white paper (2018), talks about "Black box conundrum" exposing once again the principal consequence of lack of transparency: "Marketers rarely have direct access to this source level data and instead must rely on the reporting and measurement practices of each vendor. These practices vary wildly. Some vendors might measure campaign performance one way. Others might measure it in another way. Either way, these vendors are not opening the door to allow their customers to verify what is actually happening. The result is a measurement ecosystem that is wholly opaque and inconsistent". Hence, the problem underlined in this statement, is that to carry out an programmatic advertising campaign a marketer needs to work and to face with a lot of different technologies and measurements, from here the term "block box" describing a process where there are several internal mechanisms and operations that are unknown to the outside party. Therefore, we can easily deduce how transparency in digital advertising is a fundamental topic at least for two primary aspects:

- Inventory
- Costs

The advertiser who relies on the platforms and the various agencies must know where their advertising banners end up, they must know where the money of their budget is spent, otherwise the advertising budget is substantially uncontrolled and brands are more easily subject to fraud. In recent years, the trend of marketers has been that of leaving agencies too much freedom and autonomy during the process of buying ad spaces. Nowadays, the sales process of digital advertising spaces is dominated by programmatic and platforms like Facebook and Google, which dominate unchallenged, acting almost as oligopolists. As a matter of fact, in 2017 according to a report released by IAB and conducted by PWC, the two platforms accounted for the 90% of the global digital advertising market that year.

The "impersonality" within the process for purchasing ad spaces, is a direct antagonist of the pre-digital era where this was clearly personal, what happens today is that companies have get used to spending their budgets within a process where they have a poor control. The issue of transparency subsequently gained a lot of resonance especially after, again in 2017, when the Wall Street journal published a report on how the advertisements of the big brands appeared close to racist videos on Youtube (Nicas, 2017), some of the brands involved in the report are big companies like: Microsoft, Amazon and Coca-Cola. As a consequence, many brands temporarily stopped their campaigns on Google platform. According to a recent survey conducted by the Industry Index for Metamarkets, it turned out that marketers are willing to increase their digital budgets if they can get more reliable and accurate data, but 41% of them state they do not want to increase programmatic spending until there is a better data transparency (Bauch, 2017). According to a Mckinsey's article (2018), currently advertisers are more worried about transparency under three main primary areas:

- *Programmatic fees* - very often purchasing ad spaces through programmatic entail agencies fees difficult to understand and sometimes not very clear.
- *Data and tech sharing/ownership* - agencies usually provide to companies only data generated by ad tech platforms, however those may not represent a proper tool that allows to depict an ideal overview for clients.

- *Media rebates* - frequently agencies don't disclose or apply discount, called agency volume bonuses or AVBs, that they get from media firms keeping the savings for increasing their markup.

Better transparency within the system, would also allow better advertising in qualitative terms, as a matter of fact always Marc Pitchard during his speech stated that: "better advertising requires time and money, yet we're all wasting way too much time and money on a media supply chain with poor standards adoption. Too many players grading their own homework, too many hidden touches, and too many holes to allow criminals to rip us off" (Handley, 2017).

Therefore, P&G being one of the first companies in the world, in terms of digital advertising spending, is pioneering a revolution of standards. A revolution that basically outlines a trend towards which the ecosystem is aiming: a general review of its contacts and of the entire advertising supply chain, which will necessarily have to respond to the needs of a better and clearer communication with all actors involved along the chain.

### ***1.3.3. Intermediaries***

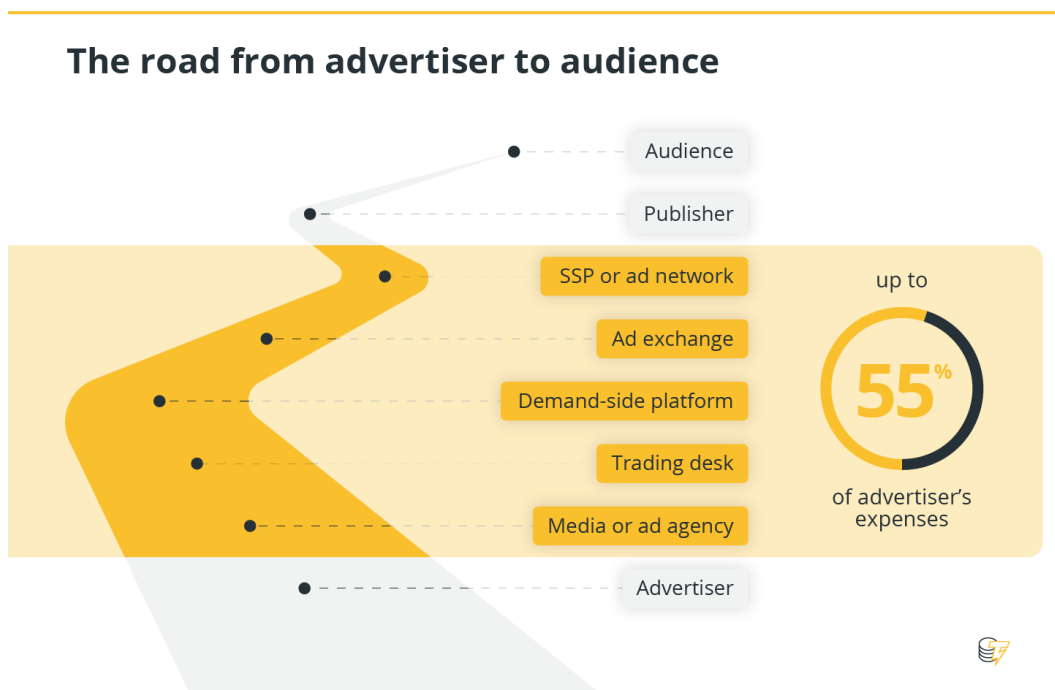
As mentioned previously, within digital advertising there are different ways to purchase ad spaces and recently the one that is growing the most is programmatic, but is also the one that is creating more efficiency problems. The black box conundrum mentioned above from Lucidity's white paper, provides a perfect panoramic of the overall environment within programmatic media supply chain, this is constituted by a lot of actors such as: ad servers, DSPs, exchanges, ad networks, DMPs, etc.

As the majority of the business models based on a chain process does, also the latter is based on an ecosystem that applies fees to others with a waterfall model, therefore each step of the chain applies a fee. More precisely the mechanism is that each intermediary in exchange for the services offered, retains a percentage of the amount initially invested by the advertiser (Iab Italia, 2018). It follows that the publisher's final revenue will be equal to the amount spent by the advertiser, net of the fees applied by the intermediaries during each step. Regarding the type of fees, the latter can be fixed, variable, hybrid, and their level mainly depends on:

- the number of players involved within the chain;
- type of the service
- level of the service

The direct consequence is an inefficient practice in pricing that erodes a huge portion of publishers revenue. From how the chain is currently structured, there are too many intermediaries that make the clarity of processes opaque and generally do not add any kind of additional value. An example of a traditional programmatic advertising chain can be summarized through the following graph:

*Fig.5 - Programmatic advertising chain*



*Source: cointelegraph.com*

The market chain map illustrated above, shows that programmatic has been integrated with traditional processes that have always governed the world of buying and selling advertising spaces. What should bring the sign of innovation, from the programmatic side, are tools that reduce the dispersion of advertising budgets for advertisers and optimize the inventory of those who sell the publishers' spaces, namely inventories. Let's move in analyzing each of

these actors involved in the chain, in order to understand their respective roles (Iab Italia, 2018):

- *The advertiser* - is the one who wants to invest an advertising budget. It can be mediated by the media center that manages the investment planning.
- *The media or ad agency* - provides a service involving the creation, planning, advertising management and other forms of promotion for its customers. Usually, it is independent from customers and guarantees an external contribution to promote their products or services.
- *The trading desk* - there is a distinction to make between independent trading desk and agency trading desk. The first are independent companies specialized in purchasing spaces in programmatic, whereas the last one is the business unit of the agency specialized in programmatic.
- *The demand side platforms (DSP)* - have been already discussed, but essentially are platforms focused on automating the purchase of advertising space and manage, as the name suggest, the demand side.
- *The ad exchange* - is a virtual table through which demand and offer meet in the auction logic, therefore the programmatic auctions are hosted indeed by the ad exchanges, connecting the sell side platform (SSD) to the demand side platform (DSP).
- *The sell side platforms (SSP)* - are platforms focused for those who sell advertising spaces. These technologies allow automation in the sale of ad spaces. Sell side platforms monetize a publisher's inventory through programmatic.
- *The Ad Networks* - are independent companies that represent more websites and have relationships both with advertisers and publishers, to sell advertising spaces on the websites. They are constantly looking to increase relationships on both sides.
- *The publisher* - is basically the owner of the spaces where the ads will be placed.

The complexity arising from the multiplicity of actors involved in each single operation has left room for possible opportunistic behaviors along the advertising chain. Furthermore, as we can observe to the right of the graph, according to a report prepared by IAB (2016) up to 55% of the expenditure of an advertiser's budget can be represented and absorbed during the 5 middle steps, highlighting once again one of the possible causes of inefficiency in this ecosystem. Therefore, taking seriously into account this problem is of vital importance for the



future of the market, because it is symptomatic regarding the opacity of this value chain, its confusion and length.

Moreover, it is an issue based mainly on the information side rather than technological side, therefore if in these processes there is a lack of clarity, it is not because the advertising technology is inadequate for the overall ecosystem, but mainly because the information on the processes and on the needs within the chain is not shared and there is not enough trust. Unlike ad fraud, this kind of problem can be easily resolved in less time because technologies already exists, what is missing is the right incentives in order to share information and make all the processes more efficient and less selfish, hence taking into account a wider perspective that is more focused on the overall chain's health and its future.

#### ***1.3.4. Ad effect measurement***

Measuring the effectiveness of an online advertising campaign is a process that allows companies to evaluate different aspects, including:

- Allows to adjust the communication strategy,
- Checks if the campaign has reached the target audience, in accordance with the objectives of the communication plan,
- Measures the cost-effectiveness of the advertising campaign,
- Determines the degree of awareness of the campaign and how this was perceived by the target audience, thus allowing to evaluate the level of perception and impact.

All of these are key factors when a company wants to assess whether or not the money it has invested to advertise his product or service have been well spent. Hence, in order to correctly proceed is necessary to be clear from the beginning on what the company wants to measure, by drawing up criteria that could vary according to companies' needs. However, the first necessary step is to have a clear definition on what means measuring the advertising effect of an advertising campaign.

Among the many definitions offered by the countless publications, between theories and concepts, there is one that is able to describe this process very clearly and in a straightforward way: "Advertising effect measurement is the process of quantifying the incremental effect of

an ad on consumer behavior. The incremental (or causal or marginal) effect of an ad is the incremental number of outcomes that were obtained as a result of the campaign, such that these outcomes would not have occurred in the absence of the campaign.” (Gordon, 2020).

Nevertheless, although the process of measuring the effectiveness of an advertising is a fundamental post-operation phase, inasmuch as provides the data that will allow the advertiser to decode what has happened and decide the budget for the future campaigns, digital advertising presents inefficiencies that often do not allow the correct measurement of the main performance indicators.

As a matter of fact, according to the recent study "Inefficiencies in Digital Advertising Markets" published in February 2020, the measurement challenges highlighted have been considered the main factors for the inefficiencies within this ecosystem. In particular, the study focuses on those critical aspects that present old and new challenges, but also opportunities for many players in the market, if they will be able to answer exhaustively and quickly, for instance among these we find:

- *Measurement and data availability.* The data available to process the performance measurements of a campaign are quite developed, however sometimes it is very difficult for advertisers to try to investigate deeply into the metrics, for instance some problems could arise when advertisers trying to link the ad exposure to the results at the individual level.
- *The complexity of ad effects.* Within a web page there can be multiple advertisements, so the effects of the latter are difficult to measure and assess, because the ads that the consumer sees are often not linear.

These are only two of the elements identified in the paper, in particular another interesting aspect discussed in the analysis is for example ad blocking. This term refers to an increasingly current phenomenon analyzed in the consumer behavior, in particular nowadays they are flooded during navigation by banners, pop up, pop under, etc. Very often, making it an unpleasant experience since judged irrelevant in relation to the consumer’s interests, consequently many of them have developed a hatred towards these methodologies, ending up

installing in their computer a software that in some cases allows to block all the advertising campaigns displayed on the web.

Broadly speaking, this behavior has been triggered by a general sense of consumers' dissatisfaction, that very often puts many business models relying on advertising in trouble, obviously some platforms have already developed methods to detect and block these software but they are not always effective. However, the main point of the analysis is that, once again, this phenomenon underlines how, within the advertising ecosystem, there are important tensions between all the actors working and involved within the environment. Therefore, is really important identifying the needs asking for a change, that will necessarily have to be solved in order to make the overall scenario more clear and usable for all actors involved.

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## Chapter 2 Blockchain technology

### 2.1. A brief history of Bitcoin and Blockchain

When it comes to Bitcoin there is often confusion, frequently people tend to overlap the concept of the latter with that of the Blockchain, in reality the Blockchain has roots slightly older than those of the first cryptocurrency.

The idea behind Blockchain technology was described in 1991, when two researchers Stuart Haber and W. Scott Stornetta, introduced a computationally practical solution for the time stamping of digital documents in order to ensure that they cannot be backdated or altered (Binance Academy, 2019). The system uses a cryptographically protected blockchain to store time-stamped documents, however this technology does not take notoriety and ends up unused. Nevertheless, the development of the Blockchain has led to the launch of cryptocurrencies and various solutions that required a decentralized platform, representing for the crypto's new world a solid infrastructure on which flourish and soar toward the banks of the revolution.

In 1992, a group of computer scientists called the cypherpunks, created a mailing list of the same name where they spread their vision to the world. The name cypherpunks comes from the words cypher, which is the algorithm used to perform encryption / decryption operations and cyberpunk, which is the artistic current born during the 80s. They were cryptographers known for having conducted battles that allowed the spread of cryptographic technologies, often misunderstood at that time, and also for having carried out attacks to government authorities using the network. Among them, the well-known names are: Bram Cohen, the inventor of BitTorrent and Julian Assange founder of Wikileaks. Specifically, this group strongly believed that digital currencies and more generally the cryptography would have guaranteed economic freedom that was not possible in the real world.

However, to be more precise, the very first cryptocurrency proposal it was not proposed by one of these, but the idea came from a certain Wei Dai, that in order to facilitate e-commerce, proposed a digital currency called Bimani. Among the various characteristics of this digital asset, some were later adopted as central elements of Bitcoin, such as non-traceability and autonomy from central authorities.

Whereas, the history of the most famous cryptocurrency begins in a fairly complicated year for the global economy, it was 2008 and in the midst of a financial crisis second only to the Great Depression, an idea was born, a vision that then turned into Bitcoin in 2009 (Comandini, 2020). From the mailing list of Satoshi Nakamoto, the pseudonym behind which the mind/minds that created and gave birth to Bitcoin are hidden, was sent an abstract that contained the vision of a new peer to peer digital currency, trying to overcome the limits of traditional finance by disintermediating it and by cutting out all the intermediaries also called middlemen, who guaranteed trust within the traditional structure and conception of finance. The abstract also included the white paper called "Bitcoin: A Peer-to-Peer Electronic Cash System", which contained in more detail all the technical information of this new vision.

To be precise, the 31<sup>th</sup> October 2008 was not the first time that a new digital currency was presented to the world, but the peculiar and new feature within this new paradigm was the fact of tracking transactions and not the currency itself. Nakamoto described the technology as "an electronic payment system based on cryptographic proof rather than trust" (Nakamoto, 2008). The main problem that Nakamoto aimed to solve was that known as "double spending", an issue related to the nature of an electronic money that sometimes allows to be duplicated and spent again, a situation that was making the adoption of electronic money very difficult.

Satoshi Nakamoto, as a solution proposed the creation of a public register that was immutable, impossible to tamper with, and that kept track of the transaction history of every single coin. This allowed to confirm that an electronic money had not already been spent, thus solving the problem of "double spending". In this way, a p2p network was created which, by tracking transactions in the blockchain, guaranteed that double spending did not occur. Basically in order to guarantee that no user could transfer coins to one subject and in the meantime promise those same coins to another, since every movement was transcribed into

the blockchain. Thanks to Bitcoin, Blockchain technologies gained a lot of resonance around the world, that's why sometimes we mistakenly see overlapping this two totally different concepts.

Among the first collaborators on the Bitcoin blockchain, there was also a very young prodigy, a programmer of Russian-Canadian origins called Vitalik Buterin. Buterin had begun to gain notoriety by writing online articles about Blockchain and Bitcoin, and by contributing some of the code. Subsequently around 2013, due to frustration with limitations of Blockchain and community resistance to its attempts to push the project in another direction, Vitalik Buterin broke away from the original project by creating a second public Blockchain called Ethereum, with the intention of solving the limitations of the Bitcoin blockchain. Ethereum was launched in 2014 following an ICO (Initial Coin Offering) worth around 18 million dollars. The main difference between the Bitcoin and Ethereum blockchains is that the latter can register not only coins, but also other assets. In the White Paper, Vitalik Buterin presented it as "a decentralized platform running smart contracts": the era of asset tokenization had begun.

The goal was to maintain all the advantages and options offered by the Bitcoin blockchain, but with wider possibilities. Since its launch, the Ethereum blockchain has been primarily used to build "smart contracts", namely contracts able to self executing based on a set of pre-established criteria. Smart contracts allow for greater decentralization and transparency, since users do not need to trust each other to enter into an agreement, but instead trusting the technology itself.

### ***2.1.1. What is Blockchain***

First of all, in order to avoid confusion we need to separate the concept of Blockchain from the concept of Bitcoin, because as written before very often people make confusion, basically the Blockchain is the underlying technology of Bitcoin and many other applications.

Let's start understanding the concept from the etymology of the word, literally block-chain that trivially is what the Blockchain is. In terms of structure, it can indeed be considered as a constantly growing series of blocks tied together; new blocks are formed only when Blockchain participants create new data to be entered, therefore we can consider Blockchain

as a set of interconnected mechanisms which provide specific features to the infrastructure (Casino, 2019).

Before going into details, it must be said that the mechanisms explained below are majority referred to Bitcoin blockchain, since there are different Blockchain and the mechanisms could slightly change from one type to another and list all the details would require more than a chapter. Hence reduced to its essentiality, the Blockchain is simply a particular type of database or at least this it was his original design, but more generally it is a distributed ledger. The Blockchain, as a matter of fact is a sub-category of those technologies called DLT (Distributed Ledger Technologies): systems that are based on a distributed ledger that can be read and modified by multiple nodes on a network. In other words, the ledger is present on multiple computers, scattered everywhere and to validate the changes carried out in the ledger, the nodes must reach consensus. In particular, the Blockchain is characterized by a ledger structured as a chain of blocks containing transactions and a consensus distributed on all nodes of the network. From a technical point of view, the Blockchain is a set of protocols and encryption methods that enable a computer network to work together in order to record data within an open, shared and safe database.

But what are these blocks made of? These blocks are data blocks, data are potentially any information that can be transcribed into the Blockchain, not just financial information but virtually everything of value. Each of these blocks has a maximum capacity, as a matter of fact each of them can contain a certain number of information, therefore when enough information are collected to fill the block, the latter is cryptographically sealed in order that it can never be reopened. Once closed, what is called a hash function in cryptography is used, allowing any type of data to be transformed into an alphanumeric string, more precisely into a 32-character alphanumeric code, thus allowing to summarize all the information contained in the block.

Subsequently, upon opening the next block, the first information entered in the heading is the hash function of the previous block, therefore each block contains the cryptographic summary of the previous block. Therefore, all data blocks created after the first are concatenated with the one before them, the implication is that in a chain the hash value of a block depends

strictly on the previous one, and obviously also on all previous ones. In this way, once recorded, the data of any block cannot be altered without modifying all subsequent blocks. Moreover, each block also contains a "timestamp" so that it is possible, at any time, know what was recorded and when. Why is this detail so important? Because it allows us to understand one of the main characteristics of the blockchain: the immutability.

In order to understand it better let's return to the hash function, the latter has a very important feature, it is unique: I can transform any information into an alphanumeric code, but having only this code, I will never be able to know the information that generated it (Comandini, 2020). Now a step forward, that information will generate that same code only and only if they remain the same, as soon as someone try to modify the information the so-called butterfly effect occurs: the code changes totally even if someone try to change the message from "hello everyone" to "hello everyone.", which seems an irrelevant detail that does not change the context of the information, but even a simple "." changes all the code.

Hence the intuition is the following: if someone tries to open a block or to modify an information not only the hash code of that block change, but that code being contained in all subsequent blocks triggers a butterfly effect, because every single registered code would change, that's why each block is consequential and chained to the next. This mechanism is used to understand if there is an intrusion, since the information cannot be modified because, as soon as someone tries to modify any information contained in any of the block, all the subsequent hash codes would change and therefore the system would realize that there is an attempted manipulation.

But here is the question: how does the system notice the attempted manipulation? To properly answer at this question there is the need to highlight the fact that the Blockchain is not a computer, it is not something physical located somewhere in the world, but is simply an infinite copy of the blockchain. Anyone can open its own computer and download the Blockchain, thus downloading a copy of all the transactions and information that were born on the Blockchain from the first day (January 3, 2009) to today. In this way, if someone hacks that computer is not doing a damage to the system, is hacking only a copy and therefore the system realizes that the copy is spoilt, and is no longer valid, consequently it would cut out



that copy from the system. This is possible because the copy of the Blockchain is on countless computers that work as a system. This system is considered very safe, inasmuch as to hack it the hacker would have to attack at the same time 50% + 1, that is the majority of all the computers that contain the blockchain. As long as only a couple of computers are hacked the majority of those containing the copy, scattered around the world, will confirm that those copies are flawed because they contain different information from that recorded in their codes. Therefore, logically the only way to successfully modify it, is that the majority become those flawed, because if someone manages to attack 50% +1 at the same time, it happens that the system wonders which of the two conflicting information is the valid one, by opting for the information contained in the majority of copies, in this case the scammers would win. However, this hypothesis it is not plausible inasmuch as besides being technically impossible so far with current technologies, it is too expensive to hack a Blockchain like Bitcoin.

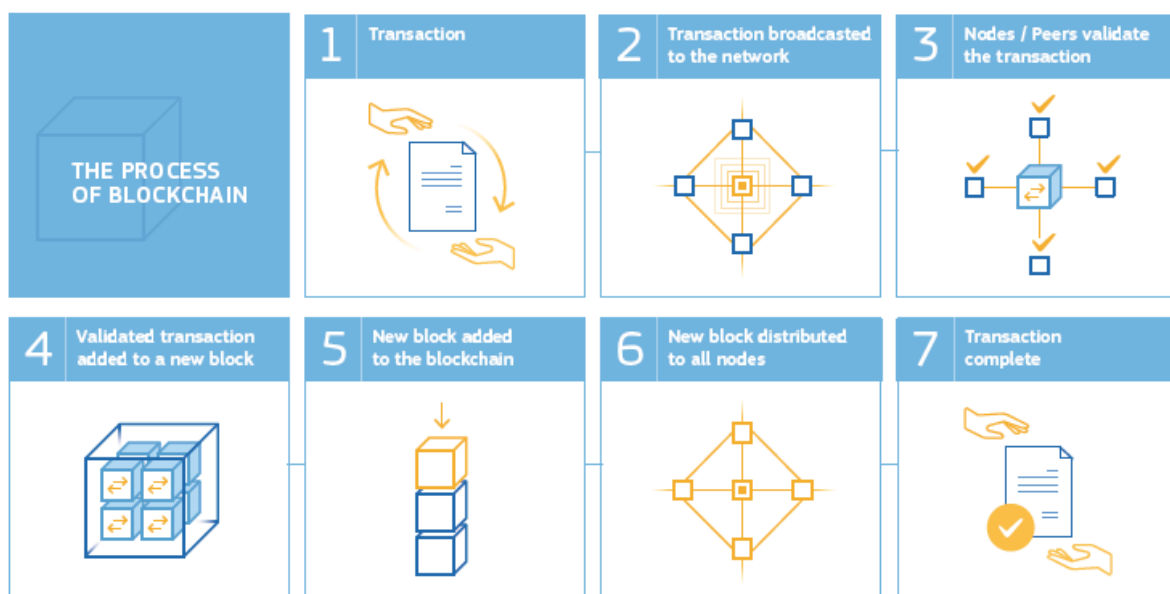
In addition, Blockchain is also made even safer by a security procedure that include what is called asymmetric encryption. By asymmetric encryption we mean when a cryptographic algorithm uses two keys, mathematically generated starting from an initial entropy, to encrypt and decrypt a message or digitally sign a document (Comandini, 2020). These two keys are generated simultaneously starting from an asymmetric cryptographic algorithm, in order to be closely tied to each other and to be able to work only with one another. The two keys are: a public key and a private key. A public key is a long, random string of numbers and represents an address on the Blockchain, basically is used to decrypt the message or verify its authenticity. Whereas a private key, is similar to a password and allows the owner to access his digital assets, it is also called Master Seed and and it is used to encrypt or sign the document. In this way, anyone can carry out an encrypted transaction to the address of a public key, but that encrypted message can only be decrypted using the private key that corresponds to that public address.

But how does the entry of data into the Blockchain take place? In a very simplified way, to make the system work, someone is needed, who in a computerized manner can verify that the information entered in the chain is true and valid. Therefore, the information before being validated and inserted within a block must be checked by a subject, who in a separate block reads the information and interrogates the system about its validity. Thus, particular

Blockchain’s participants also known as “miners”, solve difficult computational problems for reward. The latter anonymously compete on the network to solve the mathematical problem in the most efficient way, thereby adding the next block to the Blockchain (Pilkington, 2016). Consequently results that, the ledger is maintained by a network of computers that use a huge amounts of computational resources to validate each information and, in exchange for their service, usually the system rewards them with incentives in the form of coins.

However, there is an underlying issue in this system and is the fact that each node, taken individually, is not very reliable. Hence, there is the need for the system to have a mechanism for creating a consensus among all nodes, within the Bitcoin blockchain the mechanism is called Proof-of-work. In order to understand this mechanism, let’s analyze it more closely, in particular how the Blockchain works when someone requests to enter within the system a transaction.

*Fig. 6 - How Blockchain works*



*Source: Blockchain Now And Tomorrow*

Let’s take, for instance, a transaction occurring between two parties: A and B. How the graph depicts, everything starts with the transaction phase.

1. A requests a transaction with party B concerning the transfer of land ownership.

2. The transaction is broadcasted to the network, that is the system formed by countless nodes (computers).
3. Through a mechanism known as “consensus mechanism”, the transaction is then validated based on a set of rules previously stipulated.
4. Once the transaction is validated by the network, the latter is then added and linked with others validated information within a new block.
5. Subsequently this new block is added to the chain.
6. All copies of the Blockchain in each node are now updated.
7. The transaction is now successfully completed, the land ownership is transferred and more importantly is registered within the ledger.

At the point 6 during the phase in which the miners broadcast the status of the completed block to the network, the mechanism mentioned above comes into play to avoid abuse, that in case of Bitcoin blockchain is called Proof of work (PoW). This mechanism describes a system that requires a certain effort or a certain amount of resources to be invested in order to complete an activity, typically this effort is calculated in terms of "computational time" (Comandini, 2020). In this way, the system makes sure that the miners, by solving this computational puzzle, have helped to validate the information and insert it into the system and will reward them. For example, if we take into consideration the Bitcoin blockchain, it closes a block every 10 minutes and exactly at the closing of this block rewards proportionally, through a defined number of bitcoins, the miners who have contributed to provide their computing power to the system. Hence, in a simplistic way means that if, for example, the system provides a reward of 10 bitcoins at the closing of a block and to close the latter 4 miners: A, B, C and D have contributed respectively to 60%, 20%, 10%, 10 %, they will receive relatively 6, 2, 1, 1 bitcoins for their service.

As can easily be understood from what has been written so far, the concept of Blockchain is something that need to be interpreted. More than a simply technology, is a change of paradigm, a way of interpreting the great theme of decentralization and participation. For this reason, there are countless declinations, plenty interpretations and different definitions of the Blockchain.

However, within the several definitions available, the general definition of Blockchain and other distributed ledger technologies (DLTs) is: “technologies enabling parties with no particular trust in each other to exchange any type of digital data on a peer-to-peer basis with fewer or no third parties or intermediaries” (Nascimento, 2019). The system, as we discussed above, is formed by countless computers, each computer represents a node, that keeps track of data transaction. As a consequence, distributed ledger technologies can be virtually configured to register and to track every valuable information such as money transactions, passports, health information and more. Actually, there are already processes in place to track data, but nevertheless there are some specific reasons why Blockchain technology stands to revolutionize the way we interact with each other:

1. The way it tracks and stores data - Blockchain saves information in boxes called blocks which in turn are tied together in a chronological way in order to form a continuous line, literally a chain of blocks, that’s why the name “block-chain”. If there is a need to make a change to the information recorded in a particular block, the system doesn’t rewrite it, instead the change is stored in a new block, showing that the information “a” changed to “b” at a particular data and time, therefore is a non-destructive way to track data changes over time. Unlike to the older ledger method, Blockchain was designed to be decentralized and distributed across a large network of computers, each of them can be considered a node of the system.
2. It creates trust in the data - before a block can be added to the chain, there are some steps that the system requires. First, a cryptographic puzzle must be solved in order to create the block. Second, the node that solves the puzzle share the solution to all the other computers on the network, this is called “proof of work” (regarding Bitcoin blockchain). Third, the network will then verify this proof of work and, if correct, the block will be added to the chain. The combination of these complex math puzzles and verification done by many computers, ensures that everyone can trust each and every block on the chain.
3. No more intermediaries - nowadays, when doing business with one another, we do not show the other person our financial or business records. Instead, we rely on trusted intermediaries, such as a bank or lawyer, in order to view our records and keep the information confidential. These intermediaries build trust between the parties and are able to verify the rightful of the information, therefore this traditional approach limits exposure

and risks. However, it also adds another step to the exchange, which means more time and money spent. If an information, such as a land title for instance, is stored in a Blockchain this potentially cut out the middleman such as a lawyer, who would ordinarily confirm that the information is true in case of selling. This can be done because, as written before, all blocks added to the chain have been verified, secured in the Blockchain and cannot be tampered with.

## 2.2. Peculiar functions and properties

In the previous paragraph we surely could have gone into a more granular analysis regarding the mechanism of the Blockchain and its functioning, however we would have risked going into fields of study that go beyond that of this work. It follows that, the main purpose of these first two chapters, is merely that of providing the necessary tools in order to interpret the phenomenon of study and to be able to have a fairly complete macro view.

Now that we have briefly introduced what the Blockchain is and how it works, we can move on to see in more detail its functions, properties and subsequently we will go through some applications. However, in order to complete our journey we still need to insert some missing pieces to the puzzle.

Not all blockchains are public, some are private, for others you need to have a particular authorization to enter, whereas for others you don't need any authorization. In particular, we can generally find 3 main categories of blockchains depending on the management of the network and the type of authorization, these are (Casino, 2019):

- *Public* - this category includes the types of blockchains where no particular authorization is required to join the network as a user or miner, and consequently there are no barriers to entry, thereby everyone can freely carry out transactions. For this reason, this category of Blockchain is also known as public permissionless blockchain.
- *Private* - compared with the first type, for this category of Blockchain there is usually a very precise list of users with specific characteristics, called whitelist, who are allowed and authorized to perform operations on the network. In particular, given its particular specificity, this type falls within the definition of what are called permissioned blockchains.

- *Federated* - the last category is a mix of the previous two and, together with the private, falls within the definition of permissioned blockchain. Among the various characteristics, the one that distinguishes it is that, although sharing the scalability and a level of protection similar to that of the private category, here the verification of transactions takes place from a set of nodes also called leader nodes rather than from a single central entity. However, being a hybrid approach the leader nodes can delegate permissions to other users so that they can perform operations in order to reach a partially decentralized design.

However, in its classic conception, the Blockchain is based on a series of key characteristics that describe its real revolutionary power, previously we have mentioned some of these characteristics, however it is necessary to explain them in detail in order to fully understand its possible applications.

The first feature that characterized the Blockchain is the decentralization, probably this is the aspect more disruptive among the others. Nowadays, there are several decentralized systems, just think of the internet for instance, there is no central authority that owns and manages its use. In general, these types of systems need to be based on shared protocols and the easiest and most direct method to guarantee this need is certainly to create a P2P (peer to peer) network. However, in some cases this network is a minimum condition but not sufficient to guarantee decentralization, for example also Bitcoin needs that the recorded data are not falsified, not duplicable, unique, unchangeable and public. And this is exactly what the Blockchain is for, to ensure that all these conditions are met and that is why today the Blockchain is one of the very few technologies that can guarantee a true decentralization. Indeed as we saw above “A blockchain is run through a distributed network of participants who do not necessarily trust each other.” (Nascimento, 2019). Therefore, being a distributed ledger shared among the participants, clearly it is not controlled by any authority or entity except for permissionless blockchains, which are centralized or partially centralized in the case of federated. However, the real perk of this technology is precisely that of ensuring the uniqueness of an online data within a decentralized P2P network.

To better understand this fundamental feature, let's analyze the difference in the case of a monetary transaction with a centralized monetary system like PayPal and a decentralized

system like Bitcoin. Starting from PayPal, when subject A wants to send money to subject B, in this case PayPal acts as an intermediary, by checking who is the recipient user. In some cases could also decide the closure of the account of one of the two subjects, when it finds something that goes against their company policy and very often this happens without notice. Whereas regarding the decentralized Bitcoin system, the two subjects are able to recognize each other using the digital signature system. While PayPal previously acted as a third party in order to guarantee the identity of the two subjects, now with Bitcoin there is no third party acting as an intermediary because there is no need of the two subjects of trusting each other. When subject A sends money, he must necessarily identify himself through the digital signature system. Consequently in this system the role of the middleman is cut out, since his role is not necessary, inasmuch as the two subjects are able to recognize each other thanks to their public keys which are visible to all. Thanks to this mechanism the subjects are sure that the other subject with whom they are operating is actually the correct one and all the subjects within the system interested in this transaction will be able to verify it. In conclusion, the final perk underlying a decentralized system is that subjects will no longer have to trust each other to conclude any transaction, but especially they will not have to rely on third parties who act as intermediaries with the consequent savings in terms of cost.

Although at the beginning of this chapter, the latter has introduced the next peculiar feature under the name of immutability, I would like to make a small change to what was said previously. Surely, it is very difficult to try to change data or attempt to hack the Blockchain, however it is potentially possible, hence the immutability characteristic should be known instead under the name of tamper-resistant. Nevertheless, there are many texts and books where this characteristics is known under the name of immutability, but personally I find the proposal advanced by the European Commission within the paper published in 2019 entitled: "BLOCKCHAIN NOW AND TOMORROW ASSESSING MULTIDIMENSIONAL IMPACTS OF DISTRIBUTED LEDGER TECHNOLOGIES" wise and appropriate, when it speaks of tamper-resistant feature instead of immutability. Just to summarize, we have already described the fact that is virtually impossible to change or delate information within a blockchain, because once these have been verified, written and closed in a specific block on the chain the chance to change them are very low. While a centralized ledger can be changed or damaged through the violation of the central authority that manages it, in the case of the

Blockchain is good to remember that is instead almost impossible, as it would be necessary to violate all the copies of the ledger owned by all the participants of the Blockchain. Therefore it would be necessary to simultaneously do it, but being able to violate them would mean attempting what in technical jargon is commonly called 51% attack.

The latter, however, is considered a virtually impossible operation, certainly a factor that must be evaluated is the size of the blockchain in terms of participation, is therefore necessary taking into account how many nodes participate in sharing the information within that particular blockchain; the smaller it is, the more will be easy to tamper with. When we talk about tamper-resistant or simply the impossibility for a user with bad intentions to modify the information of the blockchain for a strictly personal gain, it is very often referred to very large blockchains such as that of Bitcoin. Hence, the tamper-resistant factor does not lie in the fact that this technology cannot theoretically be attacked by hackers, trying to modify blocks, but it falls into the fact that every modification that occurs is visible and shared to all. Therefore it is almost impossible to manipulate the information without anyone noticing it, metaphorically it would mean entering the Louvre museum, take a painting and think of quietly leaving the museum without anyone noticing it: utopia. Thus, this feature mainly allows and guarantees that information entered within the data blocks, acquire the characteristics of security and uniqueness.

Therefore, very often it can be wrongly read online that one of the characteristics of the Blockchain is immutability, this attribute is misused because theoretically as explained above the blockchains can be changed, so I personally agree with the Nascimento's paper when it states that "Tamper-resistant is not the same as 'immutable' or 'unchangeable', but rather means extremely difficult or hard to change". For example, over the years Ethereum Classic has been successfully attacked several times and the most recent, at the time I am writing this thesis, has been on August 29<sup>th</sup>, 2020 where the Ethereum Classic (ETC) network was hit by a 51% attack, this has produced over 7,000 blocks to reorganize. However, without going into the specific terms of the history of Ethereum, it must be specified that these attacks has been successfully carried out in the less used Blockchain after the hard fork in 2016 divided the two chains into: Ethereum Classic (ETC) and Ethereum (ETH). The one that has been attacked several times this year is the least used globally, ETC has a market cap of \$ 1.5



billion while ETH has roughly \$ 15 billion. This because ETC depends strictly on market volatility and trust in cryptocurrencies, while ETH is backed by tech giants like Microsoft and other organizations like JP Morgan Chase. This example just to emphasize the fact that, tamper-resistant should not be understood as unchangeable and therefore immutable, but rather as hard to change (Walch, 2016).

The Economist journal on October 31<sup>th</sup>, 2015 published an article entitled: "The great chain of being sure about things" where the Blockchain, at that time almost unknown to so many people, was described as a means through which it could "offer a way for people who don't know or trust each to create a record of who owns what that will compel the assent of everyone involved. It's a way of creating and preserving truth". Behind this creative definition, the last part highlights the third great feature that distinguishes this technology: transparency. Very often we hear about transparency with specific reference to the Public Administration, where free access to documents regarding the governance of public affairs and the political-institutional choices made by the administrations, should be a central aspect for the transparency of the institutions. This aspect stimulates and facilitates citizens to continuously and constantly monitor the work and decision-making processes of the PA, consequently helping them by giving them tools to verify the efficiency of the bureaucratic system. Therefore, creating and preserving truth are the two verbs that can best describe this third characteristic, transparency derives from the fact that every transaction, action, modification of information within the Blockchain is reported with a precise date and time on the ledger, but mostly this is visible to all those who are part of the system or simply want to consult the data present inside the blocks.

Taking the supply chain as an example, companies that operate with a business focus in this area not only have the certainty of the security of their data, but can also build and strengthen trust with their customers thanks to transparency. As a matter of fact, the technology is designed to give even more visibility to the complex stages of the supply chain toward constantly tracking each step involved, which allows companies to better meet customer need for more product information and at the same time meet legal requirements. The authentication and tracking of the product's path along the supply chain reveals its exact origin and history, which can help prove the statements of product claimed by companies and

ultimately help build trust. An example of this application was presented in 2019 in Italy by the Consorzio Arancia Rossa di Sicilia PGI (Protected Geographical Indication), which have implemented a blockchain-based tracking tool to eliminate food fraud and make consumers recognize the origin and genuineness of the famous red Sicily oranges. This will be possible with a simple scan of the PGI stamp present on each box or orange net; in this way, consumers by scanning the QR code will be able to view and obtain instantly a whole series of information about the specific product. This can ensure greater transparency on all stages of the supply chain, from where and when that orange was harvested, to when they were put on sale at the market.

In summary, Blockchain technology allows certain participants to have the access regarding the history of all the information contained, but we have to make a distinction. In public blockchains, anyone can download the history of that blockchain at any time, while in private blockchains the consultation of the transaction history is guaranteed only to certain users who meet certain access requirements. Therefore only in the first case, that of public blockchains, can we conclude that all transactions are transparent and visible to all, “which may increase auditability and trust within the network“ (Nascimento, 2019). However, complete transparency sometimes represents a problem for information that should not be in the public domain, such as strictly personal data. Certainly this technology offers several advantages, but being in its embryonic stage of its life cycle, several problems still need to be fixed.

When the mechanism that makes the Blockchain work have been explained, at the beginning of this chapter, it was highlighted how this technology manages to maintain very high standards in terms of security, indeed this is the fourth and last feature. As a matter of fact, the data entered successfully within the blocks are encrypted, the transactions are digitally signed and time stamped, each block is connected with the previous and the next one. Therefore, to obtain a high level of trust, Blockchain adopts various technological solutions to guarantee the identity of the actors through the digital signature, the security of the information saved by means of public key encryption, the consistency of the data with respect to changes and finally the time stamp of the data. All this whole set of mechanisms, make the level of security extremely high for those who adopt this system, however very often, understood

these characteristics, is normal to wonder: how is it possible that this technology guarantees both transparency, data security and confidentiality?

Certainly from the beginning of its introduction, the Blockchain has changed and is still introducing new paradigms, in this case above all of a legal nature. Surely this combination goes hand in hand with the problem described above during the transparency feature, obviously it must be said that within the block containing the transactions, there will not be written: "Mario sent 2 BTC to Jessica", but instead having written the names there will be displayed the public keys, hence having something like: "1Ysdjd245 sent 2 BTC to Kj7dhn329". Obviously, knowing the public key of a particular subject, is possible to trace all the transactions that the latter subject has carried out since the beginning of his Blockchain adoption. So it is true that the Blockchain guarantees data security and on one hand also privacy, but it is also true that on the other hand by knowing the public key of a given subject it is possible to know all his transactions history. Surely from this point of view there are still a couple of problems to be solved, especially regarding the blockchain-GDPR (General Data Protection Regulation) binomial. About that, the European Parliament has worked a lot, trying to tackle and developing solutions, seeking to harmonize the technology with the current privacy rules. As a matter of fact, the European Parliament published a fairly concise study of this binomial in the paper "Blockchain and General Data Protection Regulation: can distributed ledgers be squared with European data protection law?", where it is suggested the respect and the alignment with three particular policies in order to avoid a radical change of the current regulation.

The phenomenon of the Blockchain has spread within all industries, mostly with the evolution on what is know as Blockchain 2.0; traditionally this transition is strictly linked to the introduction of Ethereum. Ethereum is a distributed computing platform based on a public opensource blockchain. The transition from the 1.0 version is clear: from a simple database, this technology is enriched, becoming a platform where developers can build usable applications. Previously it has been written, when talking about security, that the Ethereum Classic blockchain had been hacked several times. This for a specific reason, Ethereum is a perfect example of a blockchain that has sacrificed a little bit of security and decentralization to have more flexibility in the scripting language for smart contracts. However, before

introduce the revolutionizing tool known as smart contract, is important at this point to distinguish some concepts, such as protocols, platforms and applications.

- Blockchain protocols are essentially the infrastructure that anyone must join if they want to enter within the ecosystem of this technology. These have a fundamental role, as a matter of fact they concretize the rules for consent, validation, incentive and participation; for instance Bitcoin is a perfect example of protocol.
- Whereas we can define the platforms as an architectural element having a mediating role between the other two elements, but which basically give developers the tools necessary to create applications. The Blockchain 2.0 platforms take the concepts introduced by the Bitcoin protocol and try to extend it to make the protocol adaptable to different needs, therefore trying to make them universally applicable.
- The applications are the result of the use of the platform by the developers. Surely, among all the applications, the one that deserves more than others to be presented in this thesis, inasmuch as is the true innovation driver of the blockchain, is the smart contract.

To be honest is not with the Blockchain that smart contracts are born and introduced, they have older roots, but it is certainly a fact that is with this technology that they have acquired a certain notoriety globally, managing to carve out their own dimension all over the world within this ecosystem. However, the name of these contracts can be misleading, in reality smart contracts per se are neither contracts, nor intelligent. Smart contracts are, in their most basic and classic definition, the transposition of a series of "if then" events, where upon the realization of one of these, the contract is able to recognize the correct occurrence of the condition and is able to self-executing any time one of the "if then" requirements is satisfied (Carboni, 2018).

A trivial example of this mechanism is given by the coffee machine in university, they are programmed to carry out a contract of the type: "If 50 cents are inserted then you dispense the espresso". In this case, the coffee machine is configured if and only if whenever there is a student, teacher or any other person that enters 50 cents, it will give in exchange an espresso, so the coffee machine must be able to control the conditions derived from the contract. As a matter of fact, the smart contract of the coffee machine is activated only when a coin with

certain characteristics: size, weight, etc. is inserted. Probably when the last time a student went to take an espresso at the coffee machine, he did not imagine this process. That's because smart contracts can self-executing indefinitely each time certain conditions have been met, without the need for intervention of a third party or the human coordination.

Now instead, let's imagine the resonance that this mechanism could have if applied with computer codes, it would be able to make some functions obsolete such as that of notaries who must verify the truthfulness within the contracts. Surely this professional figure will not disappear completely in the future, inasmuch as it will still be necessary for the various drafting of contracts, wills, and so on. Nevertheless, the control activities carried out by them will be halved if Blockchain and smart contracts are implemented. Hence, Blockchain technology can also be used to activate a whole series of decentralized services through smart contracts, where the traditional professional figure who merely has a role of trusted intermediary, will no longer be needed.

In conclusion, summing up, the smart contract is nothing more than the transposition into code of a "smart" contract developed on Blockchain (which must be carefully programmed by the developer) based on certain conditions and clauses that are carried out completely autonomously once is started. It is a digital contract in which accomplishment is guaranteed by an IT protocol, where the respect of the contract is fully automated. Therefore, once the terms of the contract have been configured, it is carried out without putting ethics, social pressures or legal repercussions into play. Regarding the Blockchain instead, the smart contract can be imagined as a safe in which we deposit money and in order to take them out, certain spending conditions must be respected, such as providing a digital signature for example. At the same time, the safe is nothing more than the output of a transaction, obviously this can be opened if and only if the conditions expressed within the output have been met. Therefore smart contracts can be compared to "boxes" where the spending conditions are expressed in a programming language called, in technical jargon "Script".

### 2.3. Coins, tokens and fundraising mechanisms

Nowadays there are about 2600 cryptocurrencies, certainly the best known is bitcoin being the first cryptocurrency, these are nothing more than digital currencies based on cryptography for

the exchange of goods and/or services. All the other cryptocurrencies after bitcoin are commonly known under the name of Altcoin, this name stands for Alternative Coin, a name to emphasize how they were conceived and issued after the first major cryptocurrency. The latter are based on Blockchain technology, but each of them has its own project or vision behind that currency, so a different goal that distinguishes them. Traditionally, these Altcoins are born from the Bitcoin source code and come into being, at least the majority of them, to try to make a change or an improvement to a specific aspect of Bitcoin. Each of them must have its own transaction register and usually the technology used for creating and implementing the register is represented by Blockchain, with the exception of some special cases that we are not going to explain in this thesis. Now coming to the most interesting part, with the creation of this register, coins and also tokens can be issued, the latter using templates provided by another blockchain. Therefore, we have to bear in mind that tokens and coins are not the same thing but both are defined under the name of cryptocurrency, let's try to clarify it.

Bitcoin has its own transaction register, its own Blockchain and that is why its tokens take the name of "coins", which are tokens that have their own reference Blockchain. However, tokens can also be issued even though they do not have their own transaction register, which are therefore based on the Blockchain of another currency. This mechanism is widely used inasmuch as is easier to rely on existing protocols rather than having to create a Blockchain from zero.

However, once the token has been issued, it can also be transformed into a coin, by creating its own transaction register which can therefore also take place after the token has been launched, an example of this is represented by Tron. As a matter of fact, initially the Tron token called TRX was first issued on the Ethereum blockchain, then its own transaction register was launched, which in technical jargon take the name of mainnet and subsequently all its tokens were converted into coins. Hence Tron is in effect a coin, although it was born as a token, but now all its tokens are stored on Tron's distributed ledger without having to rely on the Ethereum blockchain.

Summarizing, in order to successfully create and subsequently launch a token there is the need to use a platform, which is one of the elements explained above, certainly the most

famous of all is Ethereum which has standardized the type of contract in order to make it easier programming new tokens. These "standardized contracts" are commonly known under the name of ERC20, as a matter of fact is thanks to the introduction of this platform that since 2015, the market have seen a wave of new token launches. Usually, the new tokens are issued through special mechanisms including ICO, IEO, IDO, STO which are goin to be analyzed later, for now it is important to emphasize the fact that there is not only one type of token, but they are distinguished and divided into different categories based on their function.

First of all, why tokens are so important for a particular project? Tokens play such a fundamental role within the ecosystem of new blockchain-based projects, they generally help to raise funds in order that, for those who believe in the project linked to that specific token, they can support it through its purchase. Since the regulation of the whole Blockchain world is still under development over the years, different types of tokens have been developed and each of them has specific characteristics. In particular, is only in February 2018 that an institution such as the Swiss Financial regulators (FINMA) finally published guidelines that have identified and defined 4 types of token:

- *Security tokens* - this first typology of tokens represents the majority issued within STOs (Security Token Offering). Normally, the subject interested in buying them is consciously investing the money in the Security Token Offering, Initial Coin Offering or other fundraising mechanisms such as an IEO (Initial Exchange Offering) with the expectation of profit. Several US States have modified their legislation to allow smart contracts, or have implemented Sui genesis laws. Some examples of them are Arizona, Tennessee, Nevada, Delaware, Vermont, but usually they define Blockchain and smart contracts in a poor manner. Under Swiss law for instance, security tokens are treated in the same way as traditional securities (Sandeï, 2019).
- *Equity Tokens* - this type of token has the characteristic of representing the equity or some stock of the company that launches them. Given the intrinsic characteristic of this digital asset and being a completely new asset, these types of tokens are usually not commonly used in capital raising mechanisms as it is not well known what is legal and what is not.
- *Utility Tokens* - also known under the name of application tokens. They are strictly linked to the underlying project because allow people to have access to either a product or service.

Just as the tokens inside a game room allow a person to access and play with a variety of video games and other forms of entertainment, in the same way the utility tokens allow the holder to use the specific functions of a given project.

- *Payment Tokens*: the latter typology of tokens has the one and only purpose to pay for goods and / or services.

As we have previously anticipated, the issuance of the token is traditionally a way to raise funds from non-institutional investors through specific mechanisms such as: ICO (Initial Coin Offering), IEO (Initial Exchange Offering), IDO (Initial DEX Offering), STO (Security Token Offering).

Let's start with the first type which is certainly the best known, namely the Initial Coin Offering. While in traditional and regulated markets if a company wants to be listed on a specific stock exchange it must necessarily launch a public offer commonly known as IPO (Initial Public Offering), in the cryptocurrency market there is the ICO that can be defined as the young sister of the traditional IPO. Nevertheless, the substantial difference between these two lies on one hand, on the regulation that disciplines them, as a matter of fact as using an ICO to raise funds is much more simpler than complex process such as an IPO, and on the other hand the different stage of the companies' life cycle. As a matter of fact, traditionally, Initial Public Offerings are used to finance the growth of well-structured and well-known companies, whereas the Initial Coin Offerings are merely used by companies that are in a startup phase.

Hence, very often behind these realities there is only a business plan and rarely a beta version of the service that will be offered, for this reason investing in these types of mechanisms is considered a high risk investment. As a matter of fact, there is a possibility that the funds raised will help the company developing a successful project and in this case the investment will be well paid back, but it is equally true that very often these methods have been used to cheat on unconscious investors given the huge lack of legislative regulation. An ICO is a fundraising mechanism in which investors participate in the fundraising by transferring fiat currencies such as US dollars, Euros or other cryptocurrencies to the issuer in exchange for digital assets, namely tokens. However cryptocurrencies such as BTC, ETH, LTC and so on



are usually preferred during the fundraising stage. This mechanism is made for companies that operate through Blockchain and thanks to the issuance of their own token, they are able to collect funds from interested investors to finance the project.

In particular, there are some steps to fulfill, in order to successfully issue an ICO, the main ones are five:

1. *Project Blueprint* - at this stage the company has to prepare a Blueprint or a White paper to help the investors understand all the aspects of the underlying project. It is nothing more than the business plan of the business proposal that is going to be implemented with the project. It can be defined as the document that contains a deep description of the business project with a series of information such as: the analysis of business characteristics, an evaluation of its environment in which it would be developed, and the resources necessary for its implementation. A strong Blueprint should include several aspects such as technical details, economic incentives, and mostly use cases.
2. *Token Marketing* - once the white paper is created companies start the marketing phase for their ICOs in order to get the attention from potential investors and the general environment. There are several ways to start a token marketing campaign, however, special telegram channels created ad hoc are generally used, where more details are given on the launch of the token and a closer relationship with investors can be established. Even the use of specific channels, for instance such as the Cointelegraph site where there are about 7 million Crypto readers per month, are frequent. Certainly these represent highly specialized environments that offer a great chance to attract attention to the project. Obviously, this phase is probably the most important and delicate of all, inasmuch as it builds the fundamental basis of the token sale success, if the campaign is not optimized properly is very likely that the token sale phase will be a failure.
3. *Token Sale* - after the initial marketing phase, the token goes on sale at a realistic price to collect capital fund for the project. Actually before the real token sale there is phase called pre-public sale in which investors that want to join the project and buy the relative tokens can do it a lower price than the launch price. In general, among all the tokens required for issuance a more or less important percentage, which varies from ICO to ICO, is distributed in the pre sale phase (Carboni, 2018). This phase is conducted also to

see and forecast the effectively likelihood of the token sale to reach the soft cap, namely the minimum amount necessary for the project to start the project. Usually, if the soft cap is not reached, the project will be closed and all the capital raised will be returned to the investors. Therefore, it represents the minimum and necessary condition for the project to start, which is why this phase represents the real test bed for the startup, where it will be verified whether it has done well its homework.

4. *Project development* - if in the previous phase at least the soft cap, configured in order to start the project, has been reached, then this goes into development mode, after which the cryptocurrency is released at a higher price for profits. Traditionally at this stage the roadmap set within the project blueprint or in the white paper will represent the compass for the further development of the project.
5. *Exchange trading* - after the project took off, the issuer can reach also an agreement with some exchanges, in order to be listed within their platform so as to raise further capital necessary for the expansion of the project or simply to acquire further notoriety within the cryptocurrency world.

Obviously, these are all the general steps that do not involve the entry into the matter of technological processes, such as the decision to use an existing blockchain or not, choosing whether to use its own protocol or use a simpler ERC20 already configured, the configuration and the programming of the smart contract, etc.

The main features of an ICO can be summarized through the following characteristics: no intermediaries, flexibility, self - execution and liquidity. They represent also the main differences between an ICO an IPO (Initial Public Offering) which is the equivalent in traditional markets. We can therefore easily understand how simple it is compared to the traditional IPO to launch its own ICO and raise funds, as a matter of fact between 2017 and 2018 the investments related to this mechanism reached about 14 billion dollars (Comandini, 2020).

However, after the first years of "hype" towards this tool, as mentioned above, the enthusiasm of investments towards this crowdfunding mechanism has dropped a lot. This was mainly due to the high risk deriving from investing money without practically any guarantee, given that,

very often the tokens offered were of the utility type, but mostly for the high rate of failure and fraud of the company involved, which is estimated to be about 80% (Comandini, 2020). As a matter of fact, concerns about this type of crowdfunding have been addressed on several occasions by entities such as the SEC (Securities and Exchange Commission) for example one of them was in July 2017, where it warned investors about the risks of joining an ICO, stating that DAO (Decentralized autonomous organization) tokens were securities and, thus, subject to federal laws (Adhami, 2018). In Europe the European Commission on march 2018 published a document named “FinTech Action plan: For a more competitive and innovative European financial sector” underlying that tools such as ICOs “may offer firms new and innovative ways of raising capital”, but obviously “they can also present clear risks to investors. Speculative investments in crypto assets and ICO tokens expose investors to significant market risk, fraud and to cybersecurity risks” (European Commission, 2018). Even tough the majority of Countries still have no specific ICO regulation in place, Blockchain technology does not release users from the need to comply with the existing regulatory framework. However, recent developments indicate that the assumption of some market participants that ICOs were entirely unregulated is misleading. Some countries are acting as pioneers for the implementation of ICO regulations pathing the way to a more regulated approach to this new financing technique, e.g. Malta, Liechtenstein and France where legislation regarding ICO regulation is under way (Sande, 2019). Given the high risk of these types of investments and especially given the numerous failure of the projects behind ICOs, during the last few years, investors with a higher risk aversion have been moving towards investments that fall into STO category.

The Security Token Offerings (STO) are an alternative category of token offering, but compared to ICOs, the tokens issued in this type of capital raising mechanism are exclusively of the security type. Therefore, in this case the tokens have the intrinsic characteristics of the securities, so they must be mandatorily managed by a supervisory and management authority or entity. Thus, security tokens have merely a financial nature and they can represent a set of asset classes such as bonds, shares or their derivatives, ultimately we can compare a security token with the traditional securitization of different types of assets, whether they are commercial, tangible or intangible, but they are based on the use of DTL technologies (Comandini, 2020). In this way, investors are more confident in the investments they make,

because security tokens are subject to stricter regulation than other types of tokens, for example as we have seen previously, under the Swiss law they are treated in the same way as traditional securities.

The other category is the Initial Exchange Offering, basically the IEO is always a fundraiser mechanism like an ICO, but managed by an exchange acting. Exchanges are nothing more than platforms where you can buy different types of cryptocurrencies, among the best known we have: Binance, Coinbase, YOBIT, Bitstamp, Kraken and so on. The substantial difference between an IEO and an ICO lies in the marketing costs and also the process to implement an IEO. Since previously it has been described how to structure an ICO, let's see in briefly the steps needed in order to launch an IEO. Everything starts from the company that with its development team presents the project it wants to launch within a particular exchange, which in turn, evaluates and verifies it through a specific due diligence process in order to assess all the aspects. If this verification step goes well, the exchange assumes the image risk (without giving economic guarantees that everything will go well, because there is always a high-risk investment) to present the project within their platform by sponsoring it.

Once the project is ready to be presented among the public, it will be listed in preview within that specific exchange. This methodology brings various advantages including that the exchange bear all the marketing costs related to the project, which represent also the largest part of the overall costs for an ICO. In this way, is configured what in the game theory is called a win-win situation, the company on one hand have that the project and the team gain a great visibility, inasmuch as the exchange represents a perfect showcase where there are already a large pool of targeted investors which are ready to invest in new projects. Whereas on the other hand, the exchange will bear the largest part of costs. While the perks for the exchange, within this operation, will be represented in particular by acquiring new users who will register within their platform since it will be the only place where it will be possible to buy that cryptocurrency, and obviously the revenues steams represented by all the exchange fees when someone buys that token. In addition, the company must pay both listing fees and a percentage of tokens sold through IEO on their platform.

Surely ICOs and IEOs represent, among the categories of raising capital for companies operating within the cryptocurrency market, the two major mechanisms that have had greater resonance within the financial world, it is therefore interesting to investigate further underlining more specifically the differences that distinguish these two tools.

Surely the IEO mechanism has some advantages than a classic ICO, in particular the main perks are:

- *Marketing cost savings* - thanks to the support of the exchange.
- *Greater security* - in the sense that the investor is more confident in investing the money in a project where there is a risk also for a big player such as the exchange. This because before a startup is accepted by an exchange there is a due diligence phase, so the investors is more confident inasmuch as that company has successfully passed the analysis of a specialized team.
- *Transparency of the project* - having the exchange supporting the launch of the token, the overall documentation results more transparent.
- *Greater reliability* - because it is closer to a banking system than to a private initiative.

In conclusions, nowadays there is also another form of fundraising mechanism for crypto-startups called IDO (Initial DEX offering), the latter is nothing more than a IEO but the exchange in which the initial offer is implemented is decentralized. Whereas the traditional exchanges implementing IEOs are centralized, however even tough this mechanism nowadays is acquiring notoriety, is still not so popular to launch new tokens there, this mainly because the volumes on these types of platforms are too low to allow a correct optimization of fundraising (Comandini, 2020).

Therefore we can conclude that for how the market and its relatives fundraising mechanism are structured so far, the best option for a startup that wants to launch a token or a coin, is surely an IEO inasmuch as it offers the best balance between all the other mechanisms.

## 2.4. Applications

As can be deduced from the information presented so far, the Blockchain is a fairly complex phenomenon that turns out to be even more elaborate if you want to master also its technicalities. However, the core objective at the basis of this technology is actually a global and indistinct adoption of its applications, so it should be easy to use also for all those who do not have a deep knowledge on this topic.

As a matter of fact, if we look at its applications, they are increasingly gaining ground in various sectors, disrupting industries and attempting to change the current paradigms trying, where is possible, to enter in our everyday life by complying with the pragmatism that characterizes our days.

Originally the field of action of the Blockchain concerned only cryptocurrencies, however with the introduction of Ethereum and smart contracts, its applications have multiplied, reaching the most disparate sectors. Nowadays, among the many current and potential applications, we can divide and collect the fields of its action into 6 sectors in total (Casino, 2019):

- Financial
- Governance
- Business
- IoT
- Health
- Others

Surely the most iconic field of the Blockchain and the one that had the first application impacts is the financial sector. In fact nowadays, Blockchain technology is applied to a broad variety of financial fields, including for instance among the others business services, settlement of financial assets, prediction markets and economic transactions (Casino, 2019).

Among the many uses of the Blockchain within this area, one among all has had enormous resonance, also managing to have great impacts on traditional entities such as banks, in fact

some of these have adopted or are experimenting a cryptocurrency within their structure, in particular is interesting the case of Ripple. Ripple's key idea is to seek optimization of brokerage costs on financial transactions, in their documents they define themselves as: "RippleNet is a decentralized network based on an agreement between Ripple and network participants all of which utilize the same technology and adhere to a consistent set of payment rules and standards" (Ripple).

It was explained how ICOs first, then IEOs are literally dominating undisputed in the field of project financing, navigating towards the monopoly in fundraising for startups; the advantages are clear, without intermediaries the transactions are cheaper and leaner. Nowadays, the potential is clearly known to all institutions, they know that if they do not try to adapt they will surely have problems in the future, as a matter of fact in order not to be left behind, the 10 major world stock exchanges are moving, testing, analyzing in order to integrate Blockchain technology into payments, examples of this phenomenon are the Nasdaq, Chicago Mercantile Exchange (CME), London Stock Exchange, Deutsche Borse and NYSE (Rizzo, 2016). Despite the first period of repudiation towards this technology, now almost the entire financial sector is embracing the innovation of the Blockchain, representing the main driving force behind this field in the twenty-first century (Shubber, 2015).

Regarding the second large group, nowadays governments are still lagging behind in the digitization of citizens' information, very often finding major problems in managing registers. Over the years, governments tried to find methods that combine the transparency and efficiency of processes within their systems. Surely the Blockchain could bring great benefit, especially with regard to these last two aspects. The feature of transparency and that of tamper-resistant of the Blockchain, could allow a great leap forward in governments especially regarding the war on anti-corruption, offering extremely crystal clear services where citizens can check public spending at any time, and also the veracity of documents, passports, citizenship, etc. A practical example of this, is for instance the World Citizen project, which is a decentralized passport service to identify citizens all over the world (Casino, 2019).

This potential in making the government bureaucratic machine more efficient with considerable savings in terms of operating costs, has also been recognized by the European Parliament which has repeatedly published paper on paper, articles on articles trying to bring to the attention of the various Member States and not only about this technology. In particular, the activities recognized as interesting for governments are: “Potential applications include tax collection, identity management, distribution of benefits, local (or national) digital currencies, property and land registry and any kind of government record.” (Boucher, 2017).

Certainly another important pillar regarding the revolutionary potential of the Blockchain is that of business, here understood in a broad sense: from the supply chain, to advertising, from music and media industry to energy sector, therefore touching various fields, we are going to analyze briefly the most important with a particular focus on advertising which is the core of this thesis.

Nowadays, consumers are increasingly asking and want to know that the ethical claims that companies make about their goods and service are real and not just merely a marketing strategy. Therefore, Blockchain could offer transparency about the location and date of the product’s harvest. For instance, Carrefour has implemented this technology to show their customers through the ease of scanning a QR code, where their oranges come from and more precisely shows the date and geolocation of the tree, where the oranges have been harvested, as we previously seen. Even a big player like Wal-mart has introduced a blockchain-based solution for the food safety for two specific products, one for the mango produced in the United States, while the second is for the tracking of pork in China.

Food traceability is certainly the application field with the greatest results so far, there are several advantages related to the integration of this technology within the traditional supply chain. From a better management of the supply chain to a greater management of ethical issues, fostering a correct behavior. In particular, in a document written by Frank Yiannas Vice President of Food Safety for Wal-mart in 2018, he concludes that integrating Blockchain within the Wal-mart supply chain presents several advantages, in particular: “blockchain-enabled traceability will create greater food transparency, which will lead to greater accountability and incentivize every stakeholder in the food system to do the right thing every



time. Greater accountability will in turn encourage stakeholders to take greater responsibility for food safety, which will promote greater trust within the supply chain”.

Certainly from this point of view, the Blockchain offers great development opportunities, however there are still unsolved problems such as the Oracle problem. Therefore also an advanced technology such as Blockchain is subject to “the oracle problem“, which is the alteration of data during the transfer phase that starts from the outside and goes toward the Blockchain network. It could be interesting to look at the debates around it and how people claim to solve it, leading to trust-less systems that could be widely used to track down information along the supply chain, however is not the aim of this thesis.

There would certainly be other interesting fields to analyze, commenting the current status, but since the core of this thesis is that of advertising, I would like to explore it in more detail than the others. As we saw in the previous chapter, advertising presents many problems nowadays, it is therefore interesting to investigate this issue in order to analyze the possible relationship between Blockchain and advertising. In reality, the combination of the two is not new for those in the sector, as a matter of fact the IAB Italy in the Blockchain & Advertising document talks about Bladtech, namely "the set of two words: blockchain and adtech; that is, the blockchain solutions applied in the adtech sectors to solve the most common problems in the sector. This is certainly one of the hottest topics of the coming years. Many people consider BladTech to be one of the most important innovations of recent years and the foundation of the new Internet”. Like the other application areas, the Blockchain for the advertising is still in its early evolutionary stage, however it is clear that this technology, if properly implemented, has the potential to solve the major problems that are afflicting the digital advertising market. In particular, referring to what was discussed in the previous chapter, is better to remind that the four main problems that the overall digital advertising market is tackling in terms of inefficiencies are:

- Ad Fraud
- Transparency
- Intermediaries
- Ad effect measurement

To better highlight the correlation underlying between Blockchain and the entire Media & Entertainment (M&E) industry in general, IBM conducted a research in 2018 by interviewing different types of chief officers (IAB Italia, 2018). The study revealed several interesting data regarding the adoption of the technology for different reasons, specifically the IAB Italia report lists 3 major areas of interest for the integration of the blockchain, namely:

- *Improvement of digital advertising processes* - in this area among the main reasons there are all the ones previously discussed, which represent a great waste of resources for the particular ecosystem. In this case, the integration of the Blockchain takes place to improve the efficiency of complicated and opaque processes along the entire media supply chain. Therefore more efficiency both internally, within the company, and externally among the various players, in order to guarantee more lean processes. Among the various micro areas of processes that should undergo the greatest impact of this revolution, we find for instance: payment management, metrics relating to the progress of marketing campaigns, mitigation of ad frauds, audit and control and so on. Surely the greatest effects will be found in particular in programmatic advertising, a particular category of digital advertising which nowadays is especially inefficient for the various aspects already abundantly listed and described above.
- *New revenue opportunities through the integration of Blockchain into services* - in this case we refer to the fact of exploiting the technology in order to develop a whole series of opportunities that could give rise to new sources of income, to new frontiers unexplored by companies and the market in general. By doing so, the potential businesses that companies could implement would increase, but at the same time guaranteeing greater safety, transparency and efficiency. Among the various services that could be configured we find for instance, the optimization of marketing campaigns through the combination of AI and Blockchain which could lead to a more precise study of the target, making users visualize only relevant advertising, avoiding waste for advertisers. All this would favor the flourishing of multiple related services, that would stimulate growth and curiosity around this phenomenon. In this way companies and the market in general could enjoy a more functional ecosystem, with a sustainable growth where there would be less waste of resources and fewer discrepancies between the information shared among actors.

- *Development of advertising platforms that integrate Blockchain* - the third area involves the development of platforms where advertisers and publishers will be able to use a valid alternative to the channels traditionally available on the market, in order to cut out the current intermediaries that very often represent the first source of opacity. There are several current realities that have developed Blockchain based solutions in order to mitigate all those issues already discussed, especially to be able to take away some of the monopoly and power that big guys like Google and Facebook have established over the years. Very often within these platforms, the entire system of ad spaces is composed by partners who joined a community to tackle the current lack of transparency, the low investment's returns on both advertisers and publishers side.

Having introduced solid basis from which to start, is interesting to present and analyze the results obtained from one of the many projects that integrates a blockchain-based protocol into the digital advertising ecosystem. The integration of this technology should solve the main drivers of inefficiencies, especially all the problems relating to the lack of transparency underlying the digital advertising market.

In particular, programmatic advertising represents a huge source of waste, indeed is an inefficient channel due to its great complexity and the high number of actors involved along this chain. This is why Lucidity has come into play, their vision is to provide all the players along the complex programmatic advertising chain a clearer supply chain where the information and data transmitted within it are cryptographically secure, verified and without discrepancies between SSP and DSP.

More precisely, they “want publishers to receive proper credit for publishing amazing content that attracts high-value consumers. And we want to ensure that fraudsters never have the opportunity to dupe anyone into unwittingly paying for low-quality (or entirely fake) traffic” (Lucidity, 2018). Basically, the protocol developed by Lucidity allows, through the implementation of specific smart contracts, to track, evaluate, and achieve the entire digital advertising ecosystem's consensus. According to their white paper we can summarize the applications of their platform into 3 major groups:

1. *Impression Tracking and Verification* - Lucidity's verification solution is decentralized instead the traditional one is centralized, not driven by any type of consensus and this could lead to some discrepancies in the metrics.
2. *Payment Tracking* - inasmuch as everything is tracked, also the payment process is under control. Therefore publishers, the various exchanges and the other actors will be incentivized to behave honestly and correctly towards advertisers who will benefit from more transparent channels.
3. *Fraud Prevention* - they state to help also publishers to protect their inventories from those who claim to deliver high-value spaces, while they are cheating metrics through the use of bots, thereby stealing potential costumers to publishers with real high-value inventories.

It is very interesting to analyze the report they published in 2019 entitled "Ad Transparency Report 2019", in which they demonstrated and displayed that through their Blockchain protocol they were able to increase the performance of Toyota's advertising campaigns and in parallel their metrics compared to unoptimized channels.

*Fig. 7 - metrics compared*

	IMPS	CLICKS	IMPRESSION MATCH RATE	CLICK MATCH RATE	CLICKTHROUGH CONVERSION RATE
Unoptimized	11.1MM	9.9K	74%	59%	7%
Optimized	9.7MM	2.8K	81%	60%	22%

*Source: Ad Transparency Report 2019*

Their protocol helps to eliminate sources of waste at the root, as a matter of fact it constantly excludes from the network those platforms where there was a strong discrepancy between confirmed impression and total impression or total clicks vs. confirmed clicks, in order to increase performance. The metrics shown in fig. 7 have been obtained through two different campaigns, the first without optimization, while the second implemented and optimized through the Lucidity's protocol.

The increase in performance is the direct consequence of the optimization of the advertising supply chain, this is mainly due to the use of "cleaner" channels with a smaller presence of bots that necessarily have translated into more important returns, for instance we can see the 15% increase in the Click through conversion rate. Surely the increase in metrics in general, is primarily due to the fact that they have a lower number of visitors / clicks in the denominator, a consequence of the fact that Lucidity has succeeded in decreasing the number of bots and false clicks involved in the process, therefore advertisers are able to achieve higher metrics by spending less. This is a clear example of how Blockchain technology applied within the digital advertising ecosystem, in this case in particular of programmatic advertising, could represent a tool to raise quality standards within the entire supply chain and finally fix the problems that are affecting the efficiency of this market.

In conclusion, there can certainly argue that if implemented properly and wisely, Blockchain protocols could allow systems to reduce the waste of resources, mitigate phenomena such as fraud, lack of transparency of processes and unfair competition, thus creating a win-win situation for advertisers, publishers and users.

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## Chapter 3 Case study

### 3.1. Habits: a brief introduction

Over the last years, especially from the beginning of the millenium, internet has changed the way we get information, communicate with each other and even the way we shop.

Indeed nowadays, in the digital era, it is normal for consumers to allocate a large part of their budget to purchases that take place online, in just one click. However, within the Industry there are still some problems both from the sell side and the buy side, in particular the three main challenges that fashion e-commerce is tackling are (Habits, 2019):

1. *Expensive returns* - already in the 2000s the return rate for clothes purchased online was between 12% and 35% depending on the type of clothing (Lotz, 200). Nowadays, this percentage strictly depends on the type of product, regarding clothes and shoes bought on online platforms such e-commerce, the return rate is between 30% and 40% (Regan, 2019). Within the principal reasons we can find: the incorrect size of the good and that the online pic does not match the actual product. However, all of these issues represent a huge cost for fashion companies due to shipping, re-packaging, re-stocking, etc. As a matter of fact, according to a study conducted by Statista, just in the United States, the total products that will be returned will amount to \$ 550 billion this year, a stratospheric amount that further strengthen the need for companies to look for solutions in order to mitigate this huge problem. Many of them, focus on developing an infrastructure for the so-called reverse supply chain in order to make it as lean as possible, trying to compensate for the enormous costs and waste of product returns.
2. *Customer conversion rate* - The customer conversion rate is a metric that is very used in the field of online advertising, mostly in order to evaluate and keep track of the effectiveness of an advertising campaign, is one the most used KPI (Key performance indicators). In particular, this metric is calculated keeping at the numerator the total number of customers that have converted and at the denominator the total number of users that have clicked on that specific ad. Considering different platforms, the average

customer conversion rate is about 1%, more precisely according to a survey conducted by Little data in May 2020, the CVR for style and fashion is about 1.3% which is one of the lowest across all industries.

3. *Customer acquisition costs* - also known as CAC, in general is the cost to persuade a customer in order to buy the good or service advertised by the company. Is one of the metrics more used in order to assess the effectiveness of the marketing expenses, nowadays due to the main problems affecting advertising supply chain, companies are witnessing a general inefficient customer acquisition costs. This problem obviously, is strictly linked also to the previous one, since are both sons of the issues that have already mentioned before. The interesting thing here to notice, is the fact that within different platforms such as Google, Bing, Instagram, Facebook, etc, the customer acquisition cost is increasing at an incredible pace. Surely part of this phenomenon is mainly due to the increase in competition, however the overall increase in terms of cost can also be attributed to the fact that the process as a whole is highly inefficient and very costly for advertisers.

These are just the main challenges that the Fashion industry has to tackle in the upcoming years if really want to thrive and take off, otherwise is destined to be downgraded to a minority role within the great digital ocean, where the role of big fish will be embodied by other realities. Along with these issues, fashion brands that want to advertise through online channels, have also to face some inefficiencies in this field. In particular, remembering from the past chapters the four main problems that the overall digital advertising market is tackling in terms of inefficiencies are:

- Ad Fraud
- Transparency
- Intermediaries
- Ad effect measurement

Within the four categories the most challenging problems are the first two, where Ad fraud is defined as: “a collection of practices that misrepresent advertising inventory or disguised machines (bot) as humans in order to steal advertising expenditures. Most industry estimates

indicate that fraud takes 10-30% of total digital advertising revenue “ (Gordon, 2020). Advertising fraud is able to damage any type of advertising and directly damage both advertisers and publishers, hence losing in terms of finances and opportunities.

Whereas the issue of transparency is perfectly described by the quote: “Half the money I spend on advertising is wasted; the trouble is I don't know which half.” John Wanamaker (1838-1922). Here the problem is that the advertiser who relies on the platforms and the various agencies must know where their advertising banners end up, they must know where the money of their budget is spent, otherwise the advertising budget is substantially uncontrolled and brands are more easily subject to fraud.

Is in this context that, Habits, the world's first augmented reality fashion e-commerce powered by blockchain, was born by the idea of the two co-founders: Andrea Santi (CEO) and Giorgio Guidetti (CTO). More precisely, the idea underlying Habits was born in late 2017, when Tim Cook announced on the WWDC stage that the next years would have been focused on Augmented Reality (AR) and the meantime the Blockchain technology was disrupting industries, so Andrea and Giorgio understood that with a combination of the two, they could craft the solution to solve the fashion industries main problems, those already mentioned above.

Habits is a startup which aims to become an ecosystem made of both affirmed brands and independent designers, the mechanism of the platform is quite simple and straightforward: a company or an independent designer who wants to join the revolution of the fashion e-commerce, has just to register remotely, set up the stores and upload models of the creation. The 2D models then will be converted in 3D thanks to Habits' technology in order to improve the customers' engagement. Habits is born to solve the customer's need to have an immediate feedback of how the product will fit while shopping online, helping choosing the best model and reducing the need of a retail experience; as this happens, the user's engagement is also increased. Habits offers business-to-business solutions for both retail and online partners that decide to start their shop on their platform, offering many premium services, among the many the possibility to create a 3D model of a product and advertise products with an innovative process.



Habits also offers various flexible solutions, giving the opportunity to both independent designers and local shops to open their own online shop. This means that customers will be able to find a wide range of accessories, from big brands to independent designers and can try them at any time through a simple smartphone, just in one click. This completely revolutionizes the way fashion e-commerce is meant, evolving the current experience to the next level, therefore with Habits, brands can interact directly with their customers by posting updates, interactive stories and promoting their products in a more efficient way. Customers on the other hand can now try all the accessories they want in real time. Users can share photos of themselves trying on one or multiple products on social networks, in this way Habits' users advertise virally both the company and the brands while having fun. Habits aims at shifting the actual paradigm regarding the customer acquisition through gamification, therefore users download the application just for fun and strongly engage them in order to convert the latter in customers, thereby the total customer acquisition will be more effective and less expensive. The strong engagement, is made possible mainly due to the huge focus on brands, giving users the possibility to follow their favorite brands, explore new ones, and keep them updated, all in one channel.

Nowadays, brand perform online marketing activities by publishing content on third party platform and they channel a percentage of users to the websites and then convert a small fraction of those users into customers. Habits has figured out that advertising a fashion product through traditional online channel was highly inefficient, and in each step advertisers were losing more than 90% of the potential customers, whereas from an environmental point of view, fashion industry overproduction is currently considerably polluting the globe. The latter, as a matter of fact is surely one of the biggest source of waste in the fashion industry that is one of the main polluting industry worldwide. In particular, the waste in overproduction is composed by that part of the goods produced that remain unsold and there is also to consider all the waste produced by packaging, tags, hangers and bags (Jacometti, 2019).

All these reasons have been the common thread, that has driven Habits in creating its Blockchain system based on HBX utility token and launching them with a future IEO. The tokens allow fashion brands to launch targeted advertising campaigns and obtain guarantee

outcome. Moreover, 3D models uploaded on Habits will also require the use of HBX utility tokens, which in turn means that each product uploaded and its related metrics will be certified by the Blockchain, thanks to the tamper resistant characteristic of the latter. Therefore, this process creates a huge value for sellers that want to join the platform, hence they are always sure that each token spent in advertising translates into a real person trying on the product. In addition, the HBX utility token can be also used by independent designers in order to start presale campaigns, where aspiring designers can resell the fashion accessories with just 3D model, in this way they can easily apply production methodology such as MTO (Make-to-order) or ATO (Assemble-to-order) avoiding wasting money. In this way, through the pre sale campaigns, brands and independent designers are able to use a more sustainable production model, thereby reducing the pollution due to overproduction, indeed one of the Habits' aim is to reduce the latter within the fashion industry. On the other hand, the perks for the users are: they are "hit" by just extremely well targeted advertising, they can easily choose the correct size of the product from the application thanks to the augmented reality 3D model, and they can safely preorder their favorite fashion products that have not been produced yet. The users really matter for Habits, in fact an important cornerstone that must be take into account is that, at the center of the mission of Habits there are customers and within their white paper they state that "Habits' mission is to give back to shoppers what they deserve: the right to try before they buy" (Habits, 2019).

Overall, this is an amazing step forward mostly for helping brands to regain control of their marketing expenses by managing to solve the problem of transparency, furthermore by certifying each try-on, the possibility of using bots is drastically reduced. Moreover, as there was mentioned above, the fashion industry is one of the most polluting globally, this is mainly due to the fact that the majority of brands overproduce the products, this very often turn in thousands of unsold goods left in the warehouse, where in the worst scenario, the latter are destroyed. Unfortunately these episodes are not rare, for instance Amazon destroys the products that remain in stock for too long time, with terrible and irreparable consequences for the environment.

Habits cares about these issues, indeed one of the main objectives of Habits is to try to tackle this delicate issue. Consumers within the Habits platform will be able to try products directly

with special 3D filters, the goods can also be ordered in pre-sale, where emerging brands and well know brands, will be able to manage orders in the best efficient way by producing only what is strictly necessary to satisfy the demand. In addition, the data extrapolated from try ons of a specific pre-sale product can give to companies or to independent designers, a whole series of useful information about the potential appreciation of a product, based on the number of try ons, the number of times that the product has been shared and other metrics. This could represent a solid basis for forecasting the sale of products, mostly for those products that do not have historical data from which start the sales forecast.

In addition, in this way companies can reduce warehouse costs, but mostly Habits' platform can finally be able to integrate and ensure sustainable consumption, hence guaranteeing also a sustainable production patterns within the fashion e-commerce market.

### 3.2. AR, tokens and solutions

As was previously introduced, the Habits platform is fundamentally based on two main technologies: AR (Augmented Reality) and Blockchain.

Starting from the first, it generally allows the user to combine and blend elements of the real world and virtual elements created specifically in order to involve multiple senses (Morales-González, 2018). Traditionally this technology can be approached in two different ways: marker-based or markerless. In the first hypothesis, the technology works through special objects positioned in the real world through which the technology interacts, creating an interactive experience, connecting the real world and augmented reality. While in the second type we have that the technology will interact through the recognition of the surrounding environment, such as face recognition, this is the typical example of snapchat or instagram filters. Obviously, the case of AR implemented in the Habits platform is part of this second category. Augmented reality is used for different purposes and in different fields, certainly one of the most studied, where there are several publications on the subject, is the trinomial: AR, online experience and marketing. Surely this technology has enormous unexpressed potential, able to establish a more lasting bond with users that also benefits the worth of mouth, brand perception and more generally the main brand awareness measurements. There are 3 types of

shopping experience which companies could configure through the implementation of AR, these are (Cook, 2020):

- *Try-on* - the first typology refers to products that can be worn through devices, such as trying a pair of glasses with Instagram filters.
- *Try-out* - this type is used in order to allow user to place virtually products within the surrounding environment, this is the case of IKEA place app which allow customers to verify, for instance, if a particular piece of furniture fits the room in terms of style and dimension.
- *Interact* - used for interactive product such as electronic items.

Nowadays, there are more than a billion of smartphones, tablets, etc., thus having the possibility of using augmented reality (Cook, 2020), the potential and the trend that could emerge is very clear. According to the analysis carried out by Deloitte, nowadays augmented shopping can help users embark on a purchase path more pleasant and mostly a safer customer experience. Furthermore, among the sectors with the greatest impact according to the same study, we find the automotive and furniture with a positive ROI and a fairly good general adoption rate. In particular, within the article, they argue that the opportunity for the latter two are particularly good inasmuch as, in addition to having a series of standard products, there is a huge opportunity to be exploited through AR. The latter can be used mostly, in order to configure a specific customization for each customer and through the platform can immediately control and interact with the product as never done before.



Fig. 8 - Augmented shopping opportunity matrix

Source: Deloitte analysis

As can be easily infer from the matrix developed by Deloitte analysis, the apparel has been positioned with a high level of customization but a low level of standardization, in addition, together with the grocery, is part of the group still under the experimentation phase. However, in this matrix they forgot a group that would offer a high standardization and customization and very likely they didn't count under the apparel group. These type of products in my personal opinion would blend perfectly with augmented reality technology, I am obviously referring to the accessories market. Habits exploited this opportunity by specifically developing its platform, its ecosystem where potential customers or simply users could try on glasses, rings, earrings, necklaces and much more, thereby creating the first fashion AR e-commerce based on Blockchain.

Nowadays very often fashion brands are lacking in delivering content and experience that really matter for consumers, both from the advertising and customer experience side. Quoting the words of a paper on effectiveness of AR on marketing: "The Advertising industry is currently in a state of flux, experiencing a period of unprecedented change and challenge to its methods, business models and industry structures" (Bartali, 2016). Augmented reality could craft the final solution for the ultimate customer experience, thus managing to solve the fitting and size problems, that represent the greatest obstacle to the development of online shopping. This clearly tells us that online fashion retailers need to do a better job in enabling consumers to "try before buying online". Beyond the obvious suggestions of more flexible returns policies, guaranteeing in store returns, and easy change options for online purchases, there are some companies that are investing and are opting for solutions that involve the implementation of virtual fitting rooms.

In particular, this last problem has already been faced by some companies but with different solutions from those of Habits, for example Virtusize, Fits.me, True Fit and Clothes Horse, have all attempted to tackle the fit challenge with a range of technology-based solutions, from 'morphing mannequins' to size recommendation engines, all with the goal to simulate the physical fit and sizing experience. However, the user experience through the implementation of these solutions is not the best reachable, inasmuch as an avatar, mannequin or similar solution, no matter how well that platform can be configure, will never replace the accessory tried on the shape of a given user. Therefore, the so-called virtual fitting rooms, although they

can represent a tool that certainly enhances the user experience compared to traditional 2D or 3D photos, cannot solve the current limitations within the fashion e-commerce ecosystem. Hence, the Habits' solution wants to exploit augmented reality to have a realistic feeling of the accessory on the body, thereby reducing to the minimum the need of a retail experience in favor of a complete online experience. This two key advantages creates what they defined an online retail experience. Habits born exactly to solve everything that revolves around the problem of fitting, sizing and inefficiencies in advertising, in which the first two are solved by augmented reality and the latter by a mix of AR and Blockchain technology, thereby rethinking the fashion industry.

The app is very intuitive, every accessory being sold on Habits has his own product description page, where the user can find useful information about the product such as the price, other colors or sizes and high resolution pictures. Pressing the 3D Try Now button, opens up the Augmented Reality (AR) Mode. In AR Mode, the user can see an high quality 3D model of the product displayed on him, therefore the Habits' app gives to customers the possibility of try on every accessories on the platform. Thus, giving also to brands the possibility to create a more close relationship with the final consumers, without necessarily invest heavily in retail to guide customer within the physical store, with the app potential customers can try on all the accessories where and when they want in just on click.

One of the most iconic advantages of augmented reality on Habits' platform, is the fact that it offers companies a much leaner product listing chain on online channels than traditional ones. Below there is a brief analysis, regarding the steps traditionally required when a company wants to list products on an external fashion e-commerce (Habits, 2019):

1. Call sheet - is the document that incorporates all the various instructions and tasks that the agency in charge of photo shooting is required to respect.
2. Product shipped to agency - is precisely the phase in which the company ships the products to obtain professional photos in line with markets standards, which will then have to end up on e-commerce.
3. Photo shoot - the moment in which the set for the photos is specifically built.

4. Post production - a quite decisive phase mostly for photos that end up online, usually they are modified and improved through programs such as photoshop.
5. Product is sent back - the agency sends back the product object of the photoshoot, hoping that there is no damage or break of the latter.
6. Final photos are sent to the e-commerce.
7. Photos check - is the moment when e-commerce makes sure that the photos sent to it are in line with certain standards of the platform, such as lights, sets, product position, etc.
8. The product is finally listed on e-commerce platforms.

Obviously, here we are referring to those companies which want to exploit an external e-commerce platform rather than resorting to its own e-shop. Therefore in total, the fashion brand has to accomplish 8 steps in order to get the photos of the product uploaded on the e-commerce platform, whereas through the Habits AR, fashion companies can easily upload their products on the platform with less steps, and while also sustaining less costs. In general the steps required in order to get the product uploaded are:

1. *Model digitization request* - the fashion brand wishing to use the Habits platform must send a specific request for the realization of the 3D model in order to digitalize one or more products.
2. *3D model uploaded* - the 3D model of the product or products commissioned by the fashion brand are ready to be uploaded on the platform, where users will be able to try on the products on their own body, using the smartphone camera with special filters designed specifically for those accessories.

As we can deduce, the traditional 8 phases of product listing chain on online channels became 2 thanks to the Habits app, with the underlying consequence of representing a cheaper channel for companies; a very useful tool in order to improve the user experience, and more in general the overall customer path. In particular, in understanding and describing the customer path we traditionally refer to the AIDA framework (Attention, Interest, Desire and Action), subsequently modified by Derek Rucker in the four A's, that finally has been adapted to the digital and connectivity era, becoming what is known as the five A's: Aware, Appeal, Ask, Act and Advocate (Kotler, 2017). However, the customer path offered by Habits is different from

those experienced so far, hence I personally believe that the framework of the five A's must be redesigned according to the peculiarities offered by the platform and the AR, in order to have a more precise reading key to describe the overall online retail experience.

Consequently, the five A's framework which describe the customer path on Habits, must therefore be modified in a modern key and turned into what can be defined as the five S's: Surf, Select, Selfie, Share and Shop.

In the first phase, namely that of *surfing*, user who enters on the Habits' app is intent on browsing and discovering hundreds of accessories available to be tested simply in one click, using the camera of their smartphone. This phase is similar to the first phase of the five A's, or that of Aware where consumers are exposed to a long list of products from different brands, but here instead of having thousands of inputs that come from different channels. They are all channeled into the application, where users feel greater control of their own actions contrary to what traditionally happens, this is the phase that can be defined as the entry gate of the entire customer path for Habits.

Subsequently, while user scrolls and discovers hundreds of products, his attention is captured by one or more products of some brands, is precisely here that the user will *select* the latter, based on the information collected during the first phase and obviously to their preferences blended with a pinch of curiosity. This phase for the brands follows more or less the same characteristics presented in the appeal phase of the five A's where, however, even brands that had not previously captured the attention and therefore were not known by the user, have the possibility to create a connection with the latter relying on curiosity.

It is precisely through the leverage of curiosity that from the selection phase we move on to that of *selfies*, as a matter of fact user who has selected one or more products in the previous phases, wants to understand and gets more information about how the selected accessories can fit on his body through the Habits AR, which gives the possibility to try on the products listed. This phase is not only a crucial step for brands in the hope of being able to create a feeling of appreciation towards product, but mostly also represents for users a playful phase where very often they will try the accessories just for fun, with no other purposes. However, also for those



brands that fail to win user's appreciation and fail to convert him in customer through Habits AR filters, they will move on the next step, that of sharing.

By *sharing* their selfie on social media or on the main messaging platforms, the user generally looks for approval and at the same way can also support a particular brand or simply a specific accessory. This phase is a mix between the advocacy and ask phase of the five A's since, as we have just mentioned, sharing a selfie with their network can represent both phases depending on the context. However, this is a peculiar phase of the five S's, inasmuch as it may happen that user recommends the product through their own pic even before buying it. While other times this phase takes the characteristics of the ask phase of the five A's, where user through his network of friends and family on social networks, try to receive more information or simply seek approval for the next purchase. Just like in the ask stage, the customer path in this step changes from individual to social, where the reputation of the brand within the user's network will play an important role. Finally, the second hypothesis is that the user is attracted to a particular accessory and feels like recommending it to his friends and family by sharing the photo, certainly a factor that can influence and strengthen this hypothesis is also the sense of loyalty which the user developed towards the brand during previous episodes. However, these two development hypotheses of this phase, are not mutually excludable, it may happen that the user shares with his network looking for approval regarding his support for that particular accessory or brand.

Subsequently, if user has been sufficiently convinced by further information collected or simply his network has approved that particular accessory, then he will move on to the last phase of the Habits customer path, namely that of the *shop*. The user convinced enough from his social circle of friends and family, will add the product to the cart and buy it, however this phase may not end the Habits customer path, inasmuch as this last step could acquire the rebound feature. In the sense that the user, who has now become a customer, will bounce back one step and will share the latest purchase he made with his circle of friends and family. Therefore, it could happen that the five S's become six, where however the last one is simply another share with his network regarding the last purchase made.

Understanding how augmented reality applied to the Habits' platform can be a strong advantage for brands carrying out the advertising campaigns in this channel, we can move on to the more interesting and certainly more relevant side for the study of this thesis, namely Habits' tokens.

Habits wants to launch through an IEO its own tokens, more precisely the latter are utility tokens and takes the name of HBX, as we recall from the definition given in the previous chapter, the detention of these allows the holder to access or use the services offered by the underlying platform. In the case of Habits, holding a HBX token represents the right to have guaranteed a try on of the 3D model related to a particular accessory, very simply therefore: 1 HBX = 1 try on. Being a token and not a coin, HBX must necessarily be based on an external blockchain, in this case the support takes place from the Ethereum blockchain which is precisely where HBX relies. The introduction and use of HBX tokens in the Habits app will help to ensure greater transparency for fashion brands that decide to start a marketing campaign within the platform. Let's see in detail the process that a company have to follow in order to launch properly a marketing campaign on Habits app.

Brands will be able to buy HBX tokens in a safe and in a very straightforward way, by paying with fiat currency, through their admin panel presents on the platform. Then the tokens will be sent to the portfolio of the brands, that can decide whether or not to use them for the sponsorship of a specific accessory. However, in any case brands will never be required to register on external cryptocurrency exchanges for the purchase of HBX tokens, although it will be possible.

Subsequently, the 3D model of the accessory that the fashion brand wants to sponsor through the marketing campaign, must be uploaded to the appropriate section using HBX tokens.

The successful loading of the product and its subsequent updates will be transcribed through the Blockchain, which will ensure transparency along the entire advertisement process, certifying the uniqueness of the data. Habits also, as previously mentioned, will also provide a 3D modeling service for the products, in order to guarantee a complete service.

At this point, the brand can begin its marketing campaign by selecting the criteria relating to target, budget to be used and a whole series of parameters that can be customized according to the needs of the company. Once all the desired parameters have been set, the product is officially launched through the marketing campaign and is ready to receive the first try ons from the advertised users. After marketing campaign is successfully and officially lunched, the fashion brands will be able to follow the progress of the campaign in a completely live way through the specific section, where the metrics will be constantly updated in order to ensure a high level of transparency and completeness.

Once the marketing campaign has started, the budget will be represented by the number of HBX tokens within the fashion company's portfolio, which were previously allocated for that specific advertisement in the previous stages. The campaign budget will be locked until all HBX tokens are consumed, following the simple conversion that has been described earlier as  $1 \text{ HBX} = 1 \text{ try on}$ . If a fashion brand wishes to interrupt the marketing campaign, this will be possible at any time, the residual credit in HBXs will be unlocked and deposited in the wallet, available for checking on the company's admin panel.

In this way, what in Habits is called fashion tokenization arise and can thus be properly configured, brands will have total control over their marketing budget and will get greater transparency than traditional methods. This is because since every time the sponsored product is actually tried through AR from a real user, the smart contract will be activated in a totally autonomous way, with no intermediaries, no fake clicks, and no discrepancies in measurement. In this way the fashion brand can be 100% certain that if an HBX is deducted from its portfolio, it means that a real user has actually tried the sponsored product through their camera. Furthermore this transaction will be always certified by the Ethereum blockchain since, once the smart contract is activated, the information will be written indelibly on the blockchain's public register available for anyone wants to check. Therefore, using Blockchain technology, Habits can guarantee transparency on marketing campaigns so that everyone in the network can double check the target and views, and no one is going to pay more than what is due.

However, not only companies will be able to hold and purchase HBX tokens, as a matter of fact users will also be able to keep tokens in their wallet which can be used within the Habits platform to access particular promotions, exclusive products or even obtain discounts based on their loyalty tier. In this way, Habits will use tokens to create and strengthen user engagement through the form of gamification, where the underlying objective is to try to create a lasting connection with customers and a safe environment for the latter ones, in order to offer brands a multifunctional platform where users have a strong brand engagement with companies. Therefore the implementation of HBX tokens wants to be a final solution to the current problems affecting the world of digital advertising previously described, offering a valid and concrete alternative to all those realities operating in the fashion, that want to resort to a more efficient online channels than those used traditionally.

In conclusion, remembering the characteristics of the Blockchain, it can be easily understood that HBX tokens can effectively manage to solve the 4 main digital advertising problems through:

- *Fraud prevention* - the Blockchain being based on cryptography and thanks to the tamper resistant feature, it represents a perfect anti-fraud means for the digital advertising market inasmuch as is possible to verify very easily, the identity of the person who is participating in the network and which for example visualize a certain banner, and in this case, that try on the product. Therefore, keeping the register in a public form as such that of Ethereum, could potentially cut out bots that try to defraud the advertisers by making them believe they are buying real impressions, leading to a more clear market. Each time 1 HBX is spent, brands can be sure that a real user has tried the product through AR mode.
- *Transparency* - representing one of the peculiar characteristics of the Blockchain, clearly results that integrating it within digital advertising would allow to solve the second problem, precisely that of transparency along the advertising chain. Therefore, with the correct use of cryptography and smart contracts, the parties involved in a transaction within the advertising chain, are sure regarding the clarity about the whole advertising process and related costs. In this way, actors can have a clear overview of the entire advertising supply chain where the inefficiencies due to the application of fees and unclear costs will disappear, as the process will be visible to all network participants. Different experiments

and reviews have been written to confirm the positive benefits in implementing Blockchain, among many, in a paper published in by Erik Kornelson in 2017, which analyze the binomial between Blockchain and advertising, he stated that: “According to Plant, advertisers and agencies who share a Blockchain with publishers can confirm more quickly and accurately which advertising content has been placed where and for how long” (Kornelson, 2017). Therefore, as already mentioned above, the use of Blockchain technology within the Habits app guarantees transparency throughout the entire marketing campaign process.

- *Less intermediaries* - this is strictly linked with the previous one, as a matter of fact through smart contracts and decentralization, activities previously performed manually that do not add any kind of added value to the process, can now be automated through these. Ultimately, is possible to have a shorter chain by increasing the efficiency for the entire process, as a matter of fact the only two parties that will interact within the Habits advertising process, are: the brand which is basically the advertiser and Habits itself, or more precisely the platform which plays the role of publisher. No other subject is necessary for the advertising chain on Habits to work properly, in this way Habits can make sure that all those series of asymmetric information triggering the lack of transparency in traditional channels can be easily avoided.
- *Precise measurement* - through the implementation of a shared register and an appropriate configuration of smart contracts is possible to create an ad hoc ecosystem, where the reconciliation and validation of fundamental parameters for the evaluation of the online advertising campaign, such as the number of impression, is efficient without spending unnecessary resources. One of the main advantages of launching a marketing campaign through the Habits app and not resorting to traditional channels such as agencies, social networks, etc., is the fact of having full visibility and full control over what happens in the campaigns. Indeed, brands are able to adopt a strategic approach to their advertising that better fits the brands’ objectives. Taking into account the problems that arose during the investigation of the general critical issues within the measurement made in chapter 2, they have been exploited by Habits as opportunities. As a matter of fact, the problem of the complexity of the ad effects will be solved, since the try on of each accessory will be unique and can always be connected only to a single user. This will be possibile through a mixed execution of on chain and off chain mechanism, in particular: on chain mechanism is that

related to the unique user ID that looks at the sponsorship and take a token from the brand's campaign allocation wallet. Whereas the off chain mechanism, before writing the transaction within the Blockchain, verifies that the user's face tried on the 3D model has been actually displayed for more than 2 seconds. In addition, there is another step that checks also if there has been another transition on chain of that ID within the last 5 minutes, in order to avoid brands spend uselessly tokens for the same user.

### 3.3. Data analysis

In order to deepen the subject and have more information regarding the study phenomenon, it has been developed a study survey through Google forms, addressed to a specific sample of people. Precisely, the study sample was chosen to include specific professional figures, in this case the answers came from interviewees who are specialized in marketing or who, given their position, must know the mechanics behind digital advertising. In addition, the survey's sample was deliberately chosen in relation to professional figures who carry out their work within a fashion company or similar, in order to be able to give greater emphasis also to the Habits case.

In particular, the companies that compose the study sample are: Rossimoda, Safilo, effe Studio, Brunello Cucinelli, Pom Clothing, Bottega Sirvino, Gucci, Bulgari, Kering Eyewear, OVS, Nove25 and Swatch group. Regarding the structure of the questions, the survey has been organized into 3 sections, the first relating to digital advertising, the second relating to the Blockchain and the last relating to Habits.

In total, the survey is composed of 15 questions, the majority are closed questions; whereas regarding the sections, except for the first one, in the remaining two at the beginning, Blockchain technology and Habits platform functioning were briefly introduced, thus giving the interviewed important reading keys in order to be able to answer properly. Below is the table of respondents, some preferred to remain anonymous while others entered only the name, furthermore in order to protect the privacy of respondents, only the first letters of their first and last names will be indicated.

Table 1 - Survey respondents

<b>Name</b>	<b>Company</b>	<b>Position held</b>
I. V.	Safilo	Junior brand manager
V. D.	ieffe Studio	Account marketing
L. S.	Brunello Cucinelli	E-commerce specialist
A. H.	Pom Clothing	Founder - CMO
A. F.	Bottega Sirvino	Owner
A. S.	Gucci	Marketing & Communication
G.	Rossimoda	Product development assistant
Anonymous	Bulgari	Head of Accounting
A. G.	Bulldozer Group	Marketing & events manager
V. M.	Kering Eyewear	Junior communication specialist
Anonymous	OVS	Digital advertising specialist
M.	Nove25	Marketing assistant
E. M.	Swatch Group	Marketing manager

The survey reveals several interesting aspects regarding the market that has been investigated. First of all, let's analyze the data that emerged from the first section, namely that of digital advertising: 100% of the companies interviewed is investing or has invested in digital advertising, but the most significant fact captured is that all of them have, over the years, verified and experimented one or more inefficiency within the digital advertising market.

In particular, roughly the 25% of the analyzed sample declared that they had been subject, one or more times, to ad fraud phenomenon in their marketing campaigns, which through different types of mechanisms has been able to distort the real ad metrics. While, almost the 80% of companies stated that currently there is too little transparency along the media supply chain, mainly due to the numerous intermediaries that are traditionally present within the latter. As a matter of fact roughly the 85% of the analyzed sample, agreed on the fact that within the process regarding the implementation of a marketing campaign, there are too many actors involved.

Another interesting fact which further strengthens the study phenomenon of this thesis, is the fact that more than half of the sample, declared that they found it difficult to measure in detail the effectiveness of their marketing campaigns, thus facing one or more times problems related in finding the optimal measurement for their online marketing activities. While, no other particular factor relating to the inefficiency of digital advertising was generally found in the sample subject to analysis.

Overall, from the first section we can therefore conclude that within the sample subject to analysis can be highlighted how, the general problem underlying to inefficiencies within digital advertising, more precisely in the forms of: ad fraud, lack of transparency of the media supply chain, intermediaries involved and finally problems related to measurement of the campaigns implemented; represent or at least represented, a problem during the realization of the traditional online marketing activities for the companies analyzed.

The second section of the survey, specifically concerned the Blockchain technology, in particular it has been offered and clarified to the respondent the fundamental aspects of this technology, in the event that he didn't know the technology before the survey or also in the event that he didn't know precisely the principal information to understand the basis of the topic. The introduction was very short, where the peculiar elements of the Blockchain were indicated and described in a very concise way, the module description started with a general definition of the technology and then moved on to the explanation of the four main characteristics of the latter, namely: decentralization, tamper resistant, transparency and finally security. Subsequently, once the key elements have been shared in order to give enough information, so as to be able to answer in a neutral and conscious way, the survey finally moved on the second section of questions.

From this section it was possible to understand that the majority of respondents already knew Blockchain technology, as a matter of fact around the 70% answered that they had already read about this phenomenon before answering the survey. Surely, this is a very positive driver for the reference market, because it means that the professionals involved in this ecosystem are at least aware of the potential, which the implementation of this technology could have within the traditional business schemes.



However, despite the survey have highlighted a sensitive general awareness regarding Blockchain technology, the latter is still not properly exploited by companies; as a matter of fact, in spite of having the possibility of development new ways in order to innovate and make intra and inter-company processes more productive and less expensive, there is a general indifference towards these solutions. In particular, almost the 90% of the analyzed subjects stated that within their company they never heard about Blockchain technology. Moreover, to further strengthen this trend, roughly the same percentage highlighted above, stated that their company has not ever invested in these solutions or did not know if the company had ever invested in similar technologies. Only two out of 13 companies declared that the Blockchain, within their investment activities, has been subject to a placement of the budget available for these operations. Nevertheless, even considering the low degree of sample's statistical relevance, almost the total majority of the interviewees declared that they agree and are aware of the fact that Blockchain's solutions could constitute an optimal path in order to fix inefficiencies within digital advertising market, thus creating a win-win situation for advertisers, as well as publishers.

However, from this section, even if the sample examined is not large enough to be statistically relevant, it includes important Italian realities from which interesting conclusions can be deducted regarding the degree of innovativeness of the latter. Surely, it must be took into account the fact that Blockchain is still in its embryonic stage, therefore what it could become one day is still far away from its present stage. However, the interpretation underlying this small survey is that there is still too much disinformation, indifference and low curiosity degree toward Blockchain and its related world.

The third and last section was used to have a further confirmation of the work's goodness developed by Habits, mostly in trying to change the dynamics of digital advertising with a particular regard to the fashion market, thus creating solutions that could represent a valid alternative to address the problem of inefficiencies in product sponsorship campaigns. Therefore, as done in the previous section, general information on what the startup Habits is and key information related on the mechanics of their utility tokens (HBX) have been written. In particular, the company has been briefly introduced by placing it in the world of Blockchain and augmented reality e-commerce, subsequently the mechanism for digitizing

products, with the creation of 3D models for companies and independent designers, has been concisely explained. Finally, it has been clarified how, through the use of HBX and smart contract, Habits is able to guarantee safety, transparency and precision on the sponsorship of 3D models, where 1 HBX will always be equivalent to 1 try on of the advertised product.

Mostly, it has been then explained, how transparency can be guaranteed toward the use of a decentralized smart contract combined with a public register shared among all participants, where no company or independent designer who wants to exploit Habits' platform will pay more than what is due for advertise the product or products.

In particular, once the platform's mechanisms have been properly explained and its finalism briefly described, companies have shown and highlighted a huge interested for these types of solutions. For this reason, the sample has been collected almost exclusively regarding large companies operating internationally within the fashion market. In particular, the majority of all the respondents stressed their particular interest for the use of the Habits' app, as a matter of fact more than 90% confirmed that its company would be interested in selling and advertising their products within the platform.

Finally, this latter enthusiasm regarding the adoption for the solutions offered by Habits, has been further strengthened when the vast majority underlined and affirmed, how Habits and similar realities, can finally represent a final solution to all digital advertising problems related to inefficiency, that are hindering the market.

In order to have a complete overview of how the survey has been conducted in relation to the analysis carried out, below there is a summary table regarding the closed questions posed to the interviewees subject to analysis. Naturally, the open questions regarding the name, the company, and the position held of the interviewed, were not reported since they have already been summarized previously through the previous table (table 1). The questions shown in the following table are the same which the interviewees answered during the analysis, obviously for purely practical purposes, the captions relating to the introduction of sections 2 and 3 of the survey will not be reported, as their content has already been described.

Table 2 - Survey highlights

	Yes	No	I don't know
Has your company ever made investments in digital advertising?	100%	0%	
Have you ever faced ad fraud problems (a collection of practices that misrepresent advertising inventory or disguised machines (namely bot) as humans in order to steal advertising expenditures. Fake click, impressions, etc.) in your marketing campaigns?	23,1%	76,9%	
Have you ever experienced a lack of transparency within the media supply chain?	76,9%	23,1%	
In your opinion, are there too many intermediaries (ad agencies, training desk, ad exchanges, ad networks, etc.) involved in the process of a marketing campaign?	84,6%	15,4%	
Have you ever found it difficult to measure the effectiveness of a marketing campaign in detail? For example, difficulties in measuring where ad effects come from such as the fact that, within a web page, there can be multiple advertisements, making the effects of the latter difficult to measure and assess, because the ads that the consumer sees are often not linear.	61,5%	38,5%	
Did you know about Blockchain technology before this survey?	69,2%	30,8%	
Have you ever heard about Blockchain within your company?	84,6%	15,4%	
Has your company ever made investments in Blockchain?	15,4%	38,5%	46,2%
In your opinion, could Blockchain's solutions potentially fix inefficiencies in digital advertising?	92,3%	7,7%	
Could your company be potentially interested in similar solutions such as Habits?	92,3%	7,7%	

	Yes	No	I don't know
In your opinion, could similar channels become a final solution to inefficiencies in digital advertising for the fashion industry?	76,9%	23,1%	

In conclusion, after analyzing the data coming from the survey, some final considerations can be made. In particular, overall, from the data it can be deduced how the phenomenon object of analysis of this thesis, is still largely present within the reference market of the survey. As a matter of fact, by comparing the problems experienced by the subjects of the analysis, it can be deduced that the main inefficiency encountered, with a percentage of almost 85% of the interviewees, is the presence of too many intermediaries in the media supply chain, followed by the lack of transparency with almost 77%. These two problems, as analyzed during the journey within this excursus, appear to be very correlated with each other, since the presence of too many actors along the supply chain in digital advertising has contributed in an important way to obscuring the dynamics of operation for the actors at the ends of the chain.

Furthermore, even the problems relating to the difficulties in measuring the real effectiveness within marketing campaigns, is ranked at the third place among the interviewees, as a matter of fact with just over 60%, the analyzed sample highlighted the presence of this problem. This is synonymous with the lack of adequacy due to the current configuration of online channels, lack of adequacy in being able to offer solutions that can overcome the current limits regarding the inefficiency of digital advertising. While, problems relating to ad fraud phenomena are not very relevant in the sample analyzed, in fact only about a quarter of the respondents experienced this problem. Surely there is to take into account that the latter, among the 4 main problems, is also the one most difficult to identify by companies, as described in chapter 2. This highlights, once again, how the need for change through the integration of additional technologies that can help in solving these problems, is an urgent need for the market.

The market, in trying to comply with this need, could find the optimal solution through the implementation of Blockchain technology, in fact it could be the cornerstone of the next wave of revolution. The possibility that this wave is the right one to “ride”, emerged during

the analysis of the survey, where almost all of the sample confirmed how this technology can actually constitute the implementation that the market currently needs to offset all the critical issues emerged.

Habits in this context of urgent change, wants to offer a final solution to all these critical issues, mostly for all those realities operating in the fashion market that are trying to overcome the poor efficiency related to the current channels and tools. The revolutionary potential of Habits has also been widely recognized by the analyzed sample, managing to capture both the curiosity of these realities, but mostly their interest in adopting the solutions supplied by Habits. In addition, also the revolutionary power that Habits will be able to bring to fashion brands remains undisputed, in fact this has also been highlighted by roughly the 77% of respondents. Overall, the analysis conducted has underlined the urgent necessity for the digital advertising market to find a solution for its aforementioned issues, but hopefully it has brought and will bring to the attention of companies the existence of alternative path that can be taken, making the processes more sustainable and efficient.

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## Conclusions and future developments

With this thesis I wanted to analyze and investigate with a greater emphasis the inefficiencies present within the digital advertising market, inasmuch as nowadays they are too often ignored. Starting from a general introduction on what is the overview of the digital marketing environment, which is the macro category of reference for digital advertising, then gradually moved on to investigate more specifically, through a more granular inspection, the aspects and mechanisms that characterize it.

During the last decade, as a matter of fact advertising has been the undisputed protagonist of a metamorphosis towards digital, this event is effectively witnessed by the significant transition of the investment budgets dedicated to advertising campaigns, from traditional to digital methods. Indeed, more than a protagonist, it can be safely said that nowadays, it is precisely digital advertising that economically supports the majority of the instrumental structures behind the web, and consequently remunerates investments in digital. Certainly, within this context of abrupt change and due to an inefficient use of the tools offered by the aforementioned digital technologies, the establishment of highly inefficient mechanisms has taken place, which have also given rise to a whole series of side effects, particularly for advertisers and publishers. In particular, through this analysis it was possible to specifically define and identify the main sources that are acting as tributaries, expanding the problem of inefficiencies, namely:

- Ad Fraud
- Transparency
- Intermediaries
- Ad effect measurement

Subsequently, the analysis of these sources of inefficiency, from its subsequent evidence and from the considerations presented in this excursus, guided us in an attempt to clarify and outline the sudden and unstoppable ascending parable regarding a phenomenon, which in

recent years, is disrupting traditional business model schemes and its conception; a phenomenon known under the name of Blockchain technology. From all this, it was then possible to outline the concept of Blockchain and to illustrate how this new paradigm is increasingly influential and widespread in various fields today. In addition, it was also clarified that it is not actually linked only to the financial sector but indeed, given its strong presence, also within the digital advertising market.

In essence, the study tried to illustrate the methods and mechanisms through which, the implementation of the new possibilities offered by this particular DLT (Distributed Ledger Technologies) within the digital advertising field, could represent a final solution to the problems listed above. Surely, as we have abundantly highlighted in the second chapter, the phenomenon of the Blockchain is not only affecting digital advertising, as a matter of fact it has also been highlighted how it is giving a profound input for change in many sectors of the economy, so much so that, people broadly speaking about it as a "revolution". A revolution that incorporates, the potential necessary in order to “compel” many subjects in different sectors to quickly adapt to new scenarios and conditions, which will increasingly lead to the obsolescence of most traditional business models. Subsequently, by analyzing a reality already present in the digital advertising and Blockchain market, such as that of Lucidity, it was possible to analyze in a granular prospective, their applications to counter the sources of inefficiencies, and how this company approached the problem. Furthermore, thanks to their report, it was possible to give more emphasis to the positive effects regarding the implementation of Blockchain within digital advertising campaigns, thereby quantitatively underlining the improvement of marketing campaigns metrics.

Subsequently, having assessed the potential contribution that this implementation would bring to digital advertising in order to solve its current inefficiencies, the thesis moved to the case study. Here, with the analysis of the startup Habits Italia S.r.l., the study wanted to illustrate a positive example in which the implementation of new technologies helped to design new, captivating and more optimistic horizons for digital advertising within the fashion and augmented reality market.

In fact, Habits, following market trends with knowledge and originality, and taking into account the great growth potential provided by innovative markets in which it operates, has

decided to adopt and integrate the Blockchain technology through its utility tokens (HBX). The tokens have been designed as the main driver of innovation to revolutionize the traditional canons of digital advertising, and its countless problems related to efficiency. Surely, an important contribution came from the small analysis conducted through the survey, in which it was shown how these problems of inefficiency are currently present within the fashion sector, but mostly it was possible to understand that the answering companies generally agreed on the potential of the solutions offered by Habits' platform to solve market inefficiencies. Therefore, according to the evidences highlighted within the thesis can be concluded that the Blockchain can surely craft channels more efficient, in order to solve inefficiencies in digital advertising, at least for the market analyzed, which is that of fashion e-commerce.

Unfortunately, Habits being a startup in its initial phase, and therefore having few data to analyze, it was not possible to carry out a more significant analysis in quantitative terms regarding the improved marketing campaign performance. Otherwise, a much more granular analysis could have been offered, through the implementation of a statistical model. As a matter of fact, it would have certainly been interesting, being able to present a linear regression model, highlighting the type of correlation underlying between, digital advertising campaigns optimized with Blockchain and digital advertising campaigns implemented and carry out within traditional digital channels.

Finally, certainly the study carry out from this thesis can offer various insights for the analysis regarding the Blockchain and its resources, but also as many suggestions for potential future developments. Habits is just one of the many companies that can prove the enormous potential for economic and social development regarding the adoption of the Blockchain within traditional business mechanisms. There are countless process improvements that can be achieved in the future thanks to the adoption of this technology, but only provided that is used wisely, with lucidity of view and a spirit of innovation.



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