UNIVERSITY OF LJUBLJANA SCHOOL OF ECONOMICS AND BUSINESS

### MASTER THESIS

# A DECENTRALISED DIGITAL ADVERTISING MODEL WITH BLOCKCHAIN TECHNOLOGY: AN ANALYSIS OF THE BRAVE AND BAT PROJECT

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### LIST OF ABBREVIATIONS

- BAT basic attention token
- BTC bitcoin
- CPC cost per click
- **CPM** cost per thousand impressions
- $\mathbf{CTA} \mathbf{call}$  to action
- CTR click trough rate
- ETH-ether

MAU – monthly active users

**PPC** – pay per click

- **SEM** search engine marketing
- $\label{eq:series} \textbf{SERP}-\text{search engine results page}$

### **INTRODUCTION**

Digital advertising is a form of communication, which can be employed by a subject (a company, individual or other entity) to advertise a product, service, or brand, using digital channels to reach a wider audience (Rock Content Writer, 2021).

Zenith (2021) research has shown that digital advertising could exceed 60% of the total worldwide advertising expenditure in 2022, with a possible rise to more than 65% by 2024. With the total advertising expenditure that is planned to reach 873 billion dollars by 2024, digital advertising will represent a huge share of it.

In digital advertising, there are usually three parties involved (Brave Software, 2021a): the advertisers who are looking for potential customers, the publishers of content who are looking for content monetisation options, and users who are browsing online. At the moment, the biggest problem they are facing are the numerous middlemen, such as advertising platforms, technology companies or marketing agencies (Simpson, 2020), which receive up to half of the industry's ad spending (Barker, 2020).

The problems caused by middlemen have become an increasing concern for stakeholders, as they have been negatively impacting their journey online (Brave Software, 2021a). Advertisers have experienced diminished effectiveness to assess their advertising campaigns and increased costs for advertising, publishers have seen their revenue fall over the years and users have experienced increased violations of their privacy, slow page loads and increased data consumption when browsing online.

A solution to solve these problems has been steadily growing its user base, passing 50 million monthly active users and 15.5 million daily active users worldwide in December 2021 (Brave, 2022c), called Brave browser. It will be the main topic of this thesis, as it represents a good example of a decentralised and fair digital advertising model. We will look at what are the limitations of centralised solutions and how decentralised alternatives like Brave overcome those limitations, how a company's advertising performance changes using solutions like Brave ads over traditional, more centralised ones, and what's the user sentiment over Brave browser: its usability, limitations and if it is perceived as a good alternative browser compared to other ones on the market.

The thesis will be structured as follows: we will first introduce digital advertising, its history, development, models, providers and current limitations. We will then present Bitcoin, the blockchain, its future implications and potential. After that, we will move to Brave browser, Brave ads, the BAT token and the innovations of that advertising model. In the final part of the thesis, we will analyse different case studies to assess the performance of Brave ads compared to traditional paid ads. We will then survey active users to understand what is the experience with the browser, the new advertising model and its future adoption potential.

### 1 DIGITAL ADVERTISING

In order to find a what Brave is trying to improve with their innovative advertising model, we first need to go through traditional digital advertising, its history, models, providers and pricing models, moving to its problems and a deeper focus on paid digital ads, as the Brave advertising model is similar to that.

Digital advertising started with Internet and digitalisation: before that, there was just advertising, which is an old art, with a long-standing history. It is, as mentioned by the Cambridge dictionary (2022a), the "activity of making products or services known about and persuading people to buy them". It was so important that people were able to create different jobs out of it, as it is really hard for a product, service or any kind of project to reach a broad audience without somehow promote it in order to create a demand for it and make it popular on the market.

The concept behind advertising remained the same though history, but the options and tools on how to do it increased, with traditional ones (ex. direct selling) still in use and new ones (ex. online ads), which have experienced a massive growth, because they mitigate some of the risks and limitations of traditional alternatives.

#### 1.1 History of digital advertising

Digital advertising was born a few years ago, developed as a more effective and efficient alternative to traditional advertising thanks to Internet and digitalisation, which allowed the delivery of the right content to the right user at the right time.

Traditional advertising follows a "spray and pray" approach (Deshpande, 2021), where the message is delivered without any segmentation and targeting and the return on investment is usually hard to determine. Digital advertising, differently from traditional advertising, is inorganic and strongly data driven, as advertisers can target users with specific, personalised ads and look at real time results to assess how the campaign is performing. At the moment, the majority of the marketing budgets worldwide are funnelled into digital advertising: the worldwide digital advertising spending amounted to 378.16 billion dollars in 2020 and it's forecasted to almost double to 645.8 billion dollars till 2024 (AdColony, 2021). This is because it offers additional benefits that make the advertiser's job much easier: lower costs, specific targeting, increased control, better interaction with users and different formats that allow better differentiation.

Online advertising is a form of marketing that can employ different channels, such as search engines, social media, email and other methods, to deliver promotional messages of a company, product or service to the users online. All these methods have specific strengths and weaknesses, different purposes and platforms where the messages are delivered to the target audience.

Digital advertising has a short but extensive history, which all started with online banners and the so called "banner era". A banner is traditionally a long strip of cloth which is used to deliver a message, positioned in a place where many people can see it. The message can be a slogan, a logo, a symbol or any other type of advertisement (Market Business News, n.d.). Even if physical banners are still used, they have some limitations, as they can only be displayed on specific locations, they can't be modified or updated in real time, they don't allow any targeting and measuring their performance is really hard.

When Internet and digitalisation arrived, advertisers understood that the "banner" concept could be applied online. This is how digital banners were conceived. Banner ads are advertisements in the form of image, video or multimedia, which are displayed on websites. Their goal is to remind users of a product, service, brand or company or attract them to specific website sections or landing pages (Market Business News, n.d.).

The first banner ad was made by At&T and was first displayed in 1994. It appeared on the information board of HotWired, part of the Wired magazine, running for three months and costing \$30,000. The banner had standard dimension of 468x60px, consisting of a simple design and the message: "Have you ever clicked your mouse HERE? YOU WILL". It achieved an extraordinary click-through rate (or CTR) of 44%, which today would be an unrealistic result, as the average is somewhere around 0.06% (Mehta, n.d.).

While banners were taking off, the online advertising industry was making its next steps into the future. Yahoo, launched in 1995, became the first search engine for browsing the web. Technologies to track ads like the one created by Double Click were introduced, looking at a way on how to track online ads performance and ROI. They came up with a new service called dynamic advertising reporting and targeting (or DART), which offered the possibility to track the performance of an ad while it was running and make real-time changes if results were not good. Before that, they had to wait until the campaign period was completed. Due to Double Click, new models were introduced, like the cost per million impressions (or CPM), as before those advertisers had to paid a flat fee to publishers in order to have their ads displayed (Hesterberg, 2021).

Sometime later new ad formats were employed, like pop-ups, as a way to fight against users' ad blindness. Pop-ups are a simple line of code, first developed by Tripod.com, that are able to open a new browser window to be displayed on the screen (SendPulse, 2022). They were never perceived as an effective way to advertise, as they are really pushy and force the user to pay attention. What put an end to pop-ups were ad blockers, which block pushy ads so they can't open by themself.

In 1998, Google's search engine, which is still the most popular and widely used, was presented as an upgraded alternative to Yahoo. A few years later GoTo.com, a search engine company, introduced the concept of pay-per-placement, looking to create ads that would be more relevant for the targeted users, so they would not avoid them. In this model, advertisers

could bid on specific keywords, so they could target users that were interested in similar ads. This was also what lead to pay-per-click (or PPC), which had some limitations, as it was showing just the ads from advertiser who paid more, without looking at how much the displayed ad was relevant.

In 2000, Google came up with a new pay-per-click (or PPC) advertising model, together with the launch of AdWords, their advertising platform (Hesterberg, 2021). They combined a sponsored search experience with a rating of how much the content was relevant, called quality score, which is still in use today. This was also the time when social media platform started to emerge. Two big social media, Facebook and LinkedIn, made their debut at that time and soon became huge social platforms and then advertising hubs, marking the beginning of social media advertising.

Not only LinkedIn and Facebook, but also YouTube (which was later acquired by Google), Twitter and other social media emerged. For platforms that had such a big user base, ads were the best way to monetise all the data gathered from users that used their service, so they could offer it for free. Facebook was the pioneer in social media advertising: they exploited user data, so advertisers could target the ones that would most probably, based on their characteristic and behaviour, be interested in that specific ad. There were also innovations on the hardware side, as mobile devices took off with Apple's iPhone that was launched. Later on, mobile traffic overtook desktop traffic and in-app advertising surpassed mobile, marking the beginning of mobile advertising. Simultaneously, native advertising emerged. Advertisers and publishers tried to hide ads in other content in order to make it look less like an ad, mostly because it achieved higher engagement and CTR (Hesterberg, 2021). In native advertising, the format of the ad looks like a regular piece of content on the website, so the user doesn't notice it's an ad.

Going back to social media, new ones kept emerging: Instagram, Snapchat, Reddit and many more. They offered new functionalities and ad formats that were later on copied or directly purchased by competitors. All these social media, sooner or later, introduced some form of paid ads, as it was the best way for them to employ all the data they had.

We then move to 2018, when the General Data Protection Regulation (or GDPR) went into effect and completely changed how businesses have to collect, use and store customer data. Users took back some control over their data and all the businesses had to adapt to the new regulations in order to keep exploiting the data, with some of them that had to pay huge fines because they didn't respect some of the regulations (Mehta, n.d.).

Digital advertising is now exploring new technologies (Conlin, 2022), like virtual reality, artificial intelligence, internet of things voice search and blockchain technology, in order to provide users a better, more personalised experience, while moving from Web2 to Web3.

#### 1.2 Paid advertising models

In digital advertising, there are different channels and type of ads that can be employed in a marketing campaign. However, in the majority of paid advertising models online, there are usually three parties involved: advertisers, publishers and users. They represent, together with the processes that connect them, the main subjects in an advertising model. A model in this case stands for a "representation of something in words or numbers that can be used to tell what is likely to happen under certain conditions" (Cambridge Dictionary, 2022b).



Figure 1: Stakeholder relationship model in ad-supported free web publishing ecosystem

Source: Zhao, Kalra, Wang, Borcea and Chen (2019).

Above, we can see an example of how stakeholders are connected in an advertising model with no middlemen. In this case, publishers are the point of contact. Advertisers are looking for new customers online, and they do that investing money to have their ads displayed online. The ads are then, directly or indirectly, shown on publishers' websites, which have a user base that follows them and has their attention. Publishers need ads from advertisers, as they represent one of the best and easiest ways to monetize their audience. Users are the third subject in the model: they are browsing online, following their favourite publishers, while being targeted by ads from advertisers.

In this case however, all the stakeholders need each other and none of them has more power over the others: users need publishers for content, publishers need users to be appealing for an advertiser; advertisers need publishers to find new customers, publishers need advertisers to monetise their user base; users need advertisers as they allow publishers to offer content for free and advertisers need users as new leads.

Unfortunately, the example above is not a common example. As we mentioned earlier, intermediaries have emerged, looking to monetise these relationships through advertising services, marketing activities, ad exchange and other services. Many companies did that, but the most popular are Google and Meta (formerly Facebook), which were able to offer a model where all the stakeholders would go through the same platform to achieve their goal,

because of its huge network effect. As all the other platforms, they were able to generate revenue doing that, especially because they made paid ads cheaper and more accessible, with extremely specific targeting options, as these platforms had huge amount of data about their users. The example below is an example of Google's business model, which is based on paid ads to generate their revenue. As we can see, Google acts as the middleman.



Figure 2: Google's business model based on advertising

Source: Grindrod (2020).

Google and Meta are not the only companies offering similar services, but the most popular ones. Many intermediaries offer services both on the demand side and on the supply side, influencing their experience, as they generate money on behalf advertisers, limit publishers and exploit user data for targeting.

Brave was able to offer an alternative, where users, publishers and advertisers could have the best experience with no intermediaries though their browser, where they are directly in contact, while being fairly rewarded for their attention, effort or investments.

#### **1.3** Paid online advertising

When digital advertising was taking off, there were many limitations to consider, especially if smaller businesses wanted to advertise online (Treinish, 2021). At the beginning, the only option was to pay the publisher and have the same ad run on the same website for a specific period of time, with no targeting, upfront payment and without having any warranty to get any results from the campaign.

With the introduction of Google AdWords in 2000, Facebook Ads a few years later and other services, the digital advertising industry evolved and became a more accessible environment, especially for smaller advertisers with less budget. Tracking, optimization and control over

the ads were now available for everybody that was looking to promote something online. Advertisers were now able to track their ads, optimize and modify them in case they were underperforming and control, in real time, what was achieving results and how much they were paying for it. They were able to promote products and services basically anywhere: search engines, websites, social media, mediums and much more. This was all possible through paid online ads, which is how internet monetised advertising (Clemons, 2010).

Paid advertising (or PPC advertising) is, based on Treinish's definition (2021), a promotional strategy where the advertiser pays, directly or indirectly, the publisher to place the ads in the search results or on other websites in order to generate traffic back to a specific website, looking to generate awareness about the brand or new sales of their product or service.

This advertising model can employ different formats and channels, such as social media ads, search ads, display ads and other types in order to attract user's attention and stimulate their interest, generate sales, build brand awareness, generate leads, build engaged communities and drive traffic to websites (Deshpande, 2021).

There are different types of paid online ads (Kelsey, 2019), which differentiate based on the media, the placement online and the goal they try to achieve. The goal is always the same, buy user's attention. What is good with digital ads is that the performance is measurable, they allow specific targeting and they offer the possibility to reach a massive audience. As we can see from the graph below (Figure 3), most of the spending in internet advertising is funnelled into display ads (with social media that represents the majority) and search ads.



Figure 3: Internet advertising spending worldwide, by format (2007-2024)

Source: Zenith (2021).

All PPC campaigns allow numerous targeting options, which are usually based on either user's behaviour online or on the demographic characteristics he has. There are different targeting possibilities offered by advertising providers and publishers, so advertisers can exploit the best way to reach their target audience. There is for example keyword targeting (where content is matched with user search queries), dynamic targeting (where ads are based on similar content), audience targeting (based on the target audience's characteristics), contextual targeting (ads different based on the placement, topic...), remarketing (re-engage with users who came in contact before), demographic targeting (based on the age, gender, income...) and many more (Morgan, 2021). There is not a specific targeting option that is better than the others, it really depends on who the advertiser is looking for and what is the best way to reach that audience.

The first we will talk about is search advertising or search engine marketing (SEM). One of the pioneers of online ads was Google with AdWords (now called Google Ads), where they offer different types of search and display advertising. Google, which alone accounts for approximately 91% of the overall search engine market share represents, together with Bing and Yahoo, more that 95% of the total search engine market share (StatCounter, 2022). Search ads are based on keywords. Algorithms connect users queries with ads that could be relevant for them, matching the bid from the advertiser and the actual relevance of the ad with what the user is looking for, which is then presented on the top of the search engine results page, called SERP (Optimizely, n.d.).

It makes the job easier for advertisers, as they know the user is already interested in the product or service, based on the typed keyword. Each user that finds the ad relevant will click on it, which will then count as the required action and have to be paid by the advertiser to the publisher. Search ads are usually made by text, without designs or visual elements, usually employing the CPC model. They are usually composed by a title, some text and a call to action, which makes it harder to make them stand out. Here, competition can be a problem, as it makes the bid requirements for some keywords really expensive.



Figure 4: Upwork search ad on Google

Source: Sunrise (2021).

The above example shows an Upwork ad on the Google SERP, due to a winning bid and a relevant match with the keywork "hire influencers". It contains the title, the text explaining

what's it about and the call to action below it. If the user clicks on it, Upwork will pay Google the click based on the initial bid.

We then have to mention display advertising, which is another form of paid online advertising. Display ads can appear on the side, top and bottom or in the middle of any website that works as a publisher or allows ads to be placed on the site. Those types of ads have usually less competition, are less expensive and can be more dynamic, as they can have different formats: images, videos, gifs and other ones (Whatley, 2019). The biggest problem those ads face is ad blindness, which makes users avoid all the content on a webpage that is perceived as an ad, as they associate it with spam or pushy promotions. Many users addressed this problem installing ad blockers as extensions on their browsers, so they don't receive them anymore.

Display ads are widely used to enhance brand awareness of a company, service or product, which is being promoted online. The targeting is based on the user behaviour and activity and it usually employs the CPC or CPM model. There are different platforms, such as Google, Microsoft and others, that offer this type of ads on their owned and partner websites, which offer a good reach for any advertiser looking to promote online.

Display ads can be easily differentiated from the competition and can have different formats, based on the positioning they have, if they are static or dynamic, the dimension and other factors that are taken into account. We can differentiate banner ads, rich media, interstitial ads, video ads between the main ones. Below we can look at two examples of display ads from Shopify, which is an e-commerce platform. Both of them deliver a simple message, the design is in line with their brand and the calls to action (or CTAs) are short and effective. Both of them are displayed somewhere on the publisher's website, looking to capture user's attention while browsing.





Source: Heinecke (2019).

Display advertising incorporates many subcategories of paid ads, like native advertising or remarketing. Native advertising is a type of paid online ads which is not intrusive as the ads are mixed with the content of the webpage (Cyberclick, 2021). In that way, they don't look as intrusive ads, even if they have less possibility to capture the user's attention. Remarketing is also a type of display advertising. It is used to target specific users that have already visited

a page or a specific part of a website, in order to stimulate them to return to the website and complete an unfinished action or make a new one with ads that could encourage them to do so (Whatley, 2019).

Next, we have social media ads, which are somehow similar to display ads, with a major difference: they are displayed on social media platforms. Starting with Facebook and LinkedIn, most of the platform used social media ads to monetize the enormous amount of data they were able to gather from the users on their platform. Using their demographic, behavioural and other type of data, platforms were able to offer advertisers a reliable and effective advertising tool, which would allow a precise segmentation and targeting of the audience based on their interests, networks, hobbies, contacts and much more.

This is why social media ads represent the fastest-growing segment of paid online advertising. After Facebook and LinkedIn, all social media platforms started offering ads at some point, following the positive trend of global social media ad spending that it's projected to grow by 15% annually till 2024 (Gorman, 2022). What makes social media ads so appealing is also the fact that the ads platforms are quite easy to use, the ad prices are accessible also for small and medium companies and allow a huge degree of flexibility not just on the design of the ad, but for the overall content, with new ads formats that are being constantly introduced to offer advertisers better options to reach their target users. Ads went from simple text or single image types, to carousels, video and other dynamic and engaging alternatives. Social media advertising, differently from search ads, is made for the users that are not looking for a specific product or service, but they could be interested into something if they see an ad about it.



Figure 6: Canva social media ad

Source: Karlson (n.d.).

Figure 6 is an example of a Facebook ad, which is composed by the text introduction, the design and the call to action. It is a basic ad example, as it is static with no major variations, but there is still the possibility to make it unique and differentiate it.

We analysed the most popular paid advertising opportunities online, mentioning providers, models they employ and the opportunities they offer. We will now move to the most popular and widely uses pricing models for paid advertising, which is how advertisers pay for the ads to be displayed in front of the users.

#### 1.4 Online pricing models

In digital advertising, especially with paid ads, there are different types of pricing models. They represent the cost that the advertiser is required to pay when ads are displayed to users or when certain actions have taken place online. We can divide them in three broad categories: performance, CPM and hybrid models. As we can see from the table below, the proportion of internet advertising revenues which are being priced on a performance basis continues to rise, while CPM and hybrid models are experiencing a decline. This is because advertisers prefer performance-based models as they pay only when tangible results are achieved (such as clicks or conversions), and not just views, which don't guarantee any result.





Source: IAB (2020).

For all pricing models, the cost may vary, depending on the channel, type of ad and format. As a rule of a thumb, cost per action (or CPA) is the most expensive, followed by cost per lead (or CPL), cost per click (or CPC) and cost per thousand impressions (or CPM), which is usually the cheapest option. This in because CPA is a performance-based model, where the ad is connected with the result, while CPM is awareness driven, where high numbers don't necessarily mean good results for the advertiser.

CPM is usually best for brand awareness campaigns, where the impressions are used to assess the performance, then CPC, best for increasing website traffic and performance with clicks, the third one is CPL, used for lead generation and basic actions that have to be made by the user (like submit a form) and CPA, which is based on pure performance, where the conversion is the goal, usually in the form of a transaction.

Digital advertising providers offer either simple or complex pricing models, formats and executions, but CPM, CPC, CPL and CPA represent the basis to understand how pricing works for online ads. For the purpose of this thesis, we will present only CPC and CPM, without talking about CPL and CPA, as they are the pricing models that are available in the Brave advertising model.

#### Cost-per-mille or cost-per-thousand (CPM)

In this model, the advertiser cost is based on every thousand impressions the ad gets. An impression denotes the number of times an ad is displayed, so one user can make more impressions, if he sees the ad repeated times.

This model is a popular way to buy digital media, as it provides the best reach and can be applied to measure the ROI on cross-channel campaigns, where different media, platform and search engines are employed and easily compare them. It is widely used with brand awareness campaign, as there is not usually a specific conversion or action the user has to do. Its goal its basically branding a company, product or service (G2, n.d.).

To get the actual number, we need to divide the total costs by the number of thousand page views received from the campaign.

It has however some weaknesses, as many times impressions are counted even if ads are not displayed, which can happen both on desktop or mobile if the setting of the screen are different from the standard, which can cause advertisers to pay for nothing.

The main advantage of this method is that it is the cheaper one, but it is usually less effective and doesn't have a specific performance to track the results, as many users can see the ad without bringing any result to the advertiser, which is why it needs a good segmentation and targeting to work properly (Workana, n.d.).

#### Cost-per-click (CPC) or pay per click (PPC)

This is model where the cost that the advertiser pays each time is based on the user's clicks on an ad placed on the publisher website. It is probably the simplest model to understand, as it represents the amount spent to get an ad clicked (Juneja, n.d.). Its goal is to generate more traffic to the website (or a specific landing page).

This model can be employed on different advertising networks, platforms or search engines. The advertiser doesn't pay for the actual listing of the ad, but based on the performance the ad achieves.

The CPC calculation is simple, we just need to take the total advertising cost and divide them by the ads that have actually been clicked.

In the past, bots caused problems as many advertisers were spending money without getting any results, as bots were doing that. This is why Google and other ads providers had to put in place security measures and tracking so this couldn't happen.

The main advantage of this method is that the advertiser pays only when the ad has generated some interest, which is also its main disadvantage, as the click doesn't necessarily mean that the user will complete a specific action the advertiser is hoping for (Juneja, n.d.).

We just went through the main pricing models for paid advertising, with a deeper focus on the models that are relevant for this thesis. We will now move to digital advertising providers, presenting all the possible alternatives as well as the main providers and the services they offer.

#### **1.5** Paid advertising providers

There are many digital advertising providers on the market, which offer advertising services on their owned websites or work as a middleman between advertisers, publishers and users. Most of them began offering this service as a way to monetize their user's data, but it soon became a big part of their revenue (if not the main one).

Between all the providers available online, there are 3 leaders in online advertising, which act basically as a triopoly on the market, as they account for 64% of the US digital ad spending (Lebow, 2021): Alphabet (the company behind Google), Meta (formerly Facebook) and Amazon. We can look at their US digital ad revenue share on the next page (Figure 8).

Even if they are the leaders in this market, the advertising services they offer are quite different: Google is the leader in search advertising and one of the top providers of display ads, Meta is the leader in social media advertising and Amazon is one of the top providers of search and display ads.



*Figure 8: US triopoly digital ad revenue share, by company (2019-2023)* 

Google was the pioneer in providing digital advertising services to advertisers worldwide through Google Ads, which was launched in 2000, under the name AdWords. Google Ads is an online service, which allows advertisers to advertise on Google's huge network, which is composed by their property websites, partner siter and apps.

As the most popular search engine on the market, Google controls most of the global search engine market with 5.4 billion searches per day worldwide (Georgiev, 2022). Back when AdWords was launched, they saw it as a good monetisation opportunity for their huge user base, for which they had demographic and behavioural data that they could offer advertisers for better ads targeting.

Revenues made by Google offering advertising services represented 146.92 billion UD dollars out of their total revenue of 181.69 billion US dollars in 2021 (Alphabet, 2022). Most of it was made from search advertising, even if, as we mentioned earlier, they offer also display advertising on millions of partner websites.

The second main provider of digital advertising services is Meta through Facebook Ads. Same as Google, they had tons of data about their users and needed a way on how to monetize it in order to become profitable. Their advertising revenue has been constantly growing year by year from when they launched the service back in 2009, when they received 764 million dollars just from selling ads. In 2021, the revenue from providing advertising services has grown to 114 billion dollars (Meta Platforms, 2022).

Meta offers social media ads, which are displayed on their property websites. Advertisers can use different ad formats, segmentations and targeting options in order to reach users that could be potentially interested in their products or services.

The last company in the triopoly is Amazon. They launched ad services a few years ago, offering the possibility to advertisers to showcase their products on the top of the search results on their platform and other websites through display ads. Amazon is the company that has experienced the biggest growth in their revenue recently by offering this type of service to their audience, as we can see from the graph on the previous page.

But there are tons of other alternatives to Google, Meta and Amazon. Talking about search engines, Google is not the only one that offers this service. Yahoo and Microsoft (previously Bing), offer the same services, but with a lower reach as their user base in much smaller. Meta has also competition regarding social media ads. As we mentioned earlier, many social media platforms offer different types of social media ads in order to monetize their user base: Twitter, Reddit, TikTok, LinkedIn and many more. Even if they offer similar services, there are three many differences: they offer different ad formats, their user bases can be way different (different demographic, psychographic and other characteristics) and the platforms themself have very diverse purposes. Same works for Amazon, which has competition both on search and display advertising from player similar to them (like eBay) and different ones (like Google).

Here, we have to mention programmatic advertising. It is composed by a combination of artificial intelligence and real time bidding and streamline the whole process (Rask, 2022). The advertiser has to define the target market, budget and goals of the campaign, while AI will automate the advertising process. This allows access to many different devices and networks, with campaigns that are completely targeted to each user. The prices vary based on the format, device, industry and placement on the page.

There are many other providers of online ads and similar advertising, both for search and display ads. We focused our attention to the main ones, as they control a big part of the market, in order to understand how they work, why they exist and what service they offer. Even if they represent the majority of the market, there are many other providers, such as Bidvertiser, AdRoll, RevContent and more (Gibbons, 2020). They offer really similar services, which is why presenting each one wouldn't help to achieve the overall goal of this thesis, which is present Brave as an alternative to them.

#### 1.6 Problems in digital advertising

Digital advertising, similarly to traditional advertising, is not a bad thing. If paid ads are relevant and not pushy, they can help users discover new products and services they wouldn't otherwise know, while helping advertisers sell more and publishers monetize their audience.

The problem now is that users, publishers and advertisers have not much control on what happens behind the scenes of digital advertising providers. They have to accept how they are or go elsewhere, risking to lose a lot of potential customers or opportunities, as these platforms have enormous user bases.

Even if platforms like Google, Meta and Amazon have achieved astonishing results, helping so many businesses to find new customers, users to find information and publishers to monetise, their dominance in the market represents an important issue to address. A few years back there were many publishers, ad companies and online portals, which made the market more fragmented (Weaver, 2018), with less players that were that much dominant on the market. Now it's not like that anymore.

Platforms like Meta and Google manage to bring a lot of traffic to publishers, taking a disproportionate part of the earnings profiting from their work, as they are still the ones that set the rules (Vou, 2021). They have interest into keeping it like this, as ads revenue represents a big chunk of their overall revenue. But publishers demand (and need) a fairer revenue distribution, as they now get just a small percentage from the total revenues.

There is still a big monopoly: IAB (2021) mentioned that the top ten online ad companies received a 78.1% share of the total advertising revenues in 2020, up from 76.6% in 2019, with the top three tech giants that account for the majority on that share.

From the advertiser's point of view, they need more transparency regarding their advertising campaigns, more freedom to advertise and control over the operations, in order to ensure their campaigns are effective, with results and costs transparently disclosed (Vize, n.d.).

Users have seen the number of online ads grow year by year, without any control over it. Ads, which were conceived to be helpful also for them, became something to fight against, reaching a point where ads, even if useful, are being avoided.

According to a recent survey from HubSpot (Hesterberg, 2021), 91% of respondents said the today's ads are more intrusive compared to just two to three years ago. It's clear that the future of digital advertising pivots on developing a targeted ad experience that offers consumers relevant content without feeling nosy or invasive. They need to be able to accept or decline ads, but they also need to be rewarded for their attention in case they are interested into an ad, as till now they were not rewarded for it.

This is exactly why digital advertising should move from a centralised approach (due to the ad providers monopoly), to a decentralised solution where each of the stakeholders has more control over what happens and incentives to act in the best of the overall structure. A decentralised solution would provide better rewards for publishers (as no middleman would take a percentage of the revenue), more control, better results and lower costs to advertisers and more freedom to users, which would be more open to ads if they would be rewarded for their attention. This is what Brave aims to achieve, exploiting blockchain technology.

### 2 BLOCKCHAIN

We can't talk about blockchain without mentioning Bitcoin, its first use case. We will look at the reasons behind its creation, its key features and qualities, and the economic implications of it, as it is what allows some fundamental elements of the Brave advertising model, like their cryptocurrency and the data management system.

#### 2.1 Bitcoin and the blockchain

Bitcoin and the blockchain are two concepts that are frequently mentioned together. And there is a reason behind it: they were somehow born together.

Blockchain as a technology was first mentioned in 1991, when two mathematicians named Stuart Haber and Scott W. Stornetta were looking at a cryptographically secured system where time stamps could not be tampered (Iredale, 2020). The only problem with this new technology is that there was not a specific use case until 2008, when a user with the pseudonym Satoshi Nakamoto published a whitepaper on a cryptography mailing list, named "Bitcoin: A Peer-to-Peer Electronic Cash System". This was the first time Bitcoin was mentioned, and this marks also the first appearance of a use case for blockchain technology.

Bitcoin is, based on the Investopedia definition (Frankenfield, 2021), a decentralized digital currency. Satoshi Nakamoto introduced it as a purely peer-to-peer version of electronic cash (Nakamoto, 2008). But there is more than that behind it.

The paper was developed to find a solution to the increasing lack of trust in financial institutions and middlemen on the market, probably as a result after the financial crisis that happened between 2007 and 2008. Bitcoin aimed to be a blockchain based, open source, decentralised alternative to centralised structures, which were one of the main causes of the financial crisis. With it, users could have full ownership of their assets and send them anywhere at any time with limited fees, fewer external risks, better security and control though a trustless and transparent solution, where the network is based on mathematical properties rather than on trust in central authorities (like fiat currencies) or physical properties (like gold), which were the cause of many problems in history (Bitcoin, n.d.).

The Bitcoin network has been steadily growing its popularity and adoption since its genesis block back in 2009. Less developed countries have been leading the chart, as it represents a solution in places where bank services are not available (or not trusted) or where the legal tender currency is not reliable due to inflation and lack of trust in the government. It was born as a currency: the first reliable, decentralised digital one. But with years passing by people realised it can also be a reliable store of value too (similarly to gold).

Traits of Money	Gold	Fiat (US Dollar)	Crypto (Bitcoin)
Fungible (Interchangeable)	High	High	High
Non-Consumable	High	High	High
Portability	Moderate	High	High
Durable	High	Moderate	High
Highly Divisible	Moderate	Moderate	High
Secure (Cannot be counterfeited)	Moderate	Moderate	High
Easily Transactable	Low	High	High
Scarce (Predictable Supply)	Moderate	Low	High
Sovereign (Government Issued)	Low	High	Low
Decentralized	Low	Low	High
Smart (Programmable)	Low	Low	High

Table 1: Comparison between gold, fiat money and Bitcoin

As we can see above (Table 1), it shares or outperforms many characteristics of money (fiat currencies) and gold (Cryptonews, n.d.):

- Durability: every bitcoin can be traded and reused countless times without the risk of degradation or damage;
- Portability: bitcoins are easy to "transport" and transfer;
- Fungibility: each bitcoin has the same value regardless of its history and owners;
- Scarcity: there is a limited supply of only 21 million bitcoins that will ever be mined (the process of supplying the market with new bitcoins), with 19 million bitcoins approximately in circulation (Blockchain, 2022) and around 3 million of them that have been lost forever due to lost wallets, transactions to inexistent or incorrect addresses and other reasons (Kuhn, 2021). The quantity can't be inflated with an increased supply, which makes it digitally scarce and deflationary.
- Divisibility: bitcoins are perfectly divisible up to eight decimal places, which constitutes a new unit called Satoshi-s.
- Recognisability: with an increasing adoption, many new users, businesses and merchants accept it as a means of payment;
- Decentralisation: there is not a central authority that can control, censor or influence the Bitcoin network. It is managed by its users in a completely decentralised way;
- Accessibility: every person with an internet connection and a laptop/phone can buy and sell bitcoins. There is no need for a bank account or any middleman: the only thing that is needed is a cryptocurrency wallet;
- Programmability: the Bitcoin network can be updated if there is consensus from the majority of the network. In case an issue arises, it can be solved from the majority.
- Security: each bitcoin transaction is secured through blockchain technology, which makes it impossible to counterfeit a bitcoin. Transactions are recorder on a distributed ledger, which is accessible to everybody and secured by nodes in the network.

Source: Cryptonews (n.d.).

The Bitcoin market capitalisation has experienced an enormous growth, from roughly 1 billion in 2013 to 1,156.49 billion in October 2021 (Coinmarketcap, 2022), which is its current all-time high at the moment. Even if Bitcoin represents the first cryptocurrency, there have been thousands of new ones that were born after it, such as BAT tokens in the Brave ecosystem. All of them have been using blockchain technology to make them scarce and valuable, as it prevents the possibility for double-spending, giving them digital unicity.

Blockchain is referred to as distributed ledger technology (or DLT). It is, based on the Investopedia definition, a "distributed database that is shared among the nodes of a computer network" (Hayes, 2022b). Basically, a shared digital ledger of transactions distributed across the users who are part of the network, which allows a decentralised and secured record of transactions, where there is no need for a trusted third party to work as the middleman to supervise.

It is structured, as the name suggests, as a chain of blocks. Each block contains information (any kind, but mostly transactions) that are grouped together to fill a block, which has a determined size and available information storage. When a block is filled, it is closed and connected to the previous one. The data is recorded, distributed and chronologically structured, so each block that is added to the chain becomes part of the timeline with a specific timestamp that marks its creation. The blocks that are added cannot be modified, so all the data that is entered is irreversible.

Blockchains are transparent, accessible, immutable, secure, decentralised and distributed. They can't be altered or changed, because all the nodes in the network have a copy of the digital ledger, with no central authority solely owning it. When a new block is added, it can't be modified, updated or deleted from anybody. All the information is protected through hashing (a cryptography method), so the information on the network hides their true nature. All blocks have a unique hash and contain the hash of the previous block, so if one is altered the network can simply find out. To hack a blockchain, the hacker should gain control of more than 50% of a blockchain's hashing power, which would be extremely costly and difficult to do. Every node has a copy of the ledger, so it can't be lost or compromised from a malicious hacker, while decentralisation is achieved because users are disincentivised to act against the network as they would act against their own interest.

Blockchains can provide improved accuracy, cost reduction, efficiency and transparency, representing an upgraded version of traditional centralised ledger systems, which had many issues compared to blockchain solutions, like single points of failure, limited or absent transparency, high cost and low security. This is why the worldwide spending (IDC, 2021) into blockchain solutions has been growing year by year. In 2017 it was "only" 0.96 billion, in 2021 it has grown to 6.6 billion and it is forecasted to reach 19 billion by 2024. This has been mostly driven by price increases of cryptocurrencies like Bitcoin and Ethereum and other innovations powered by blockchain technology like fungible tokens, non-fungible tokens (or NFTs) and decentralised finance (or DeFi)

The second most popular blockchain at the moment, after Bitcoin, is Ethereum. And even if both of them have been growing simultaneously, the reasons behind their growth are completely different. Bitcoin is a digital currency, which acts as an alternative store of value (we can think of it as a digital version of gold). This is why its demand has been steadily increasing simultaneously with its price. From the other hand, Ethereum has been growing in popularity (and price) too, but this happened due to the need to utilize ether, their token, in order to utilize the Ethereum blockchain.

Ethereum, similarly to other blockchains, is completely programmable through a programming language called Solidity. Each user can improve it because it is open source, which is also why some innovations in this space have been developed and implemented so fast. All the community works on it to improve existing programs and create new ones.

Ethereum is, as their website states, the "community-run technology powering the cryptocurrency ether (ETH) and thousands of decentralised applications (or dapps)", that was created in 2015 by Vitalik Buterin and his team (Ethereum, 2022a). Dapps are like normal apps but with a major difference, they run on a peer-to-peer, decentralised network, which is the blockchain (Hussey & Chipolina, 2020). They combine different smart contracts that constitute the dapps and a visual frontend users see that makes it easier for them to interact with it. Smart contracts constitute the backend of a dapp. They are simply programs stored on a blockchain that run when predetermined conditions are met (IBM, n.d.). We can think about them as digital, automated traditional contracts, which are programmed to do an action when certain conditions are met. What makes them different is that they are executed by decentralised technology and not by a centralised entity, such as a company or an individual.

Because of their decentralised nature, dapps have some key qualities: they are open-source, their data is publicly available, they have no downtime, are censorship resistant and have a cryptographic token which is used to secure the network. They have also some weaknesses compared to centralised alternatives, like the fact that they are more subjectable to hacks, need a user base to function properly and usability can still be a struggle, especially for inexperienced users (Hussey & Chipolina, 2020).

Blockchains like Ethereum have opened a completely new word, with many innovations that have been developed using smart contracts, which are growing in popularity and usage, like fungible tokens, decentralised finance (DeFi) and non-fungible tokens (NFTs). For the purpose of this thesis, we will present just fungible tokens, as BAT tokens are one of them.

There are different types of digital tokens, which are created through smart contracts, with transactions that are stored on the blockchain. As the most used blockchain for new tokens generation at the moment is Ethereum, with its native token which is ether, we will introduce ERC tokens, which can be either fungible or not-fungible. ERC is a standard, which stands for "Ethereum request for comment". It is used for all the suggestions to improve Ethereum

(tokens included), where the community decides to accept or reject it. There are for example ERC-20 tokens, which are fungible and indistinguishable and widely used, where each has the same value as other ones as they have the same characteristics, like the BAT tokens we will present later on in this thesis.

We introduced the main characteristics of the two most popular blockchains, Bitcoin and Ethereum, to understand their purpose and why the technology behind them is so revolutionary. We will now try to connect them with the marketing field.

#### 2.2 Equal distribution of power and control

We have already mentioned that one of the most important key features of blockchain technology is that offers complete, transparent decentralisation. Decentralisation and an equal distribution of power and control have become important needs for today's society, which is overcrowded with many middlemen and centralised systems that don't allow an equal control distribution and complete freedom for all the stakeholders (Stevens, 2021).

An example of this centralised approach is the marketing sector, where numerous middlemen receive up to half of the industry ad spending (Barker, 2020). In this case, a middleman can be the advertising platform, the technology company, or the marketing agency, which somehow supports the advertiser but takes a piece of the ad spending resources from the total budget (Simpson, 2020). The advertiser, together with users and publishers of content, have little power over these centralised systems, which give them limited control on their operations. The problem is that most of the time they can't switch or complain about their situation, because of the big network effect that is present on these big, centralised platforms.

However, in order to clearly understand how we reached this point, we need to go back to the late 1990s. At that time, the first version of the Internet, which is commonly referred as Web 1, was starting its slow but steady adoption. That version of the Internet was mostly made of links and static homepages, websites were not interactive, the majority of users was just consuming the content and publishing options were limited. Pages were simple, with basic designs and limited advertising options. It was basically a content delivery network for simple information and no interactivity.

The next step was Web 2, which happened some years later due to new technologic advancements. Users transformed from exclusive content consumers to content creators too, as there were many more options to do so that were simple to use like forums, marketplaces and blogs. User generated content increased, usability and interoperability improved. It became a participative network, with the content that became more dynamic and responsive and new advertising options started to be tested. This also masks the advent of social media as a new channel for the users. This had many upsides: new and dynamic content, increased output and better interconnection, but with a major downside: how social media companies were tracking and storing user's data and what were they doing with it. There were no

specific regulations, which is why many profited on it at the beginning and paid huge fines later on (ex. Meta) (Sharma, 2022).

The third upgrade, which we are currently experiencing, is the upgrade from Web 2.0 to Web 3.0, where the main drivers, as we mentioned earlier, are blockchain, the numerous middlemen and strong centralisation of the current systems. Users are in fact, under the control of big, centralised tech companies, which have full power to do whatever they want and act based on their own judgement. These companies created amazing, free services, but users soon realized that those services were free because they were paying with the lack of ownership over their operations, together with the data they were subsequently giving them. In Web 3, users (all of them) can get back the control over their operations though blockchain. They will be able to influence the governance and operations of every protocol and project they are participating in and act accordingly. They will not be just customers, but members of a decentralised community, where nobody has full ownership and control and choices are taken by the majority in a transparent, uncorruptible way (Sharma, 2022).

Talking about decentralisation, Amazon has a section on their website talking about decentralisation and blockchain (AWS, n.d.). They mention that "decentralising the management and access to resources in an application, provides greater and fairer service", even if they are in fact fully centralised and users have no control over the platform. But centralisation is not a problem, if users have complete freedom on those platforms. Sometimes it's even needed in order to develop them.

Blockchain protocols, dapps and other blockchain solutions can have different levels of decentralisation, which are based on the maturity of the solution, reliability, consensus mechanism, incentive model and how good is the founding team to find the right balance between centralisation and decentralisation. Most of the projects need a team to start, which makes them centralised. But then is a team's job to find the way how to decentralise it and when decentralisation is the best option for the project. There are usually some elements where it's better to have decentralisation (ex. governance or security) and some where it's more effective centralisation (ex. costs).

Some blockchains require more and some less decentralisation. In order to explain why, it's best to look and analyse the blockchain trilemma. This refers to the fact that networks based on blockchain technology can (at the moment) only provide two out of three benefits at any given time, which are security, scalability and decentralisation (Cryptopedia, 2021).

As we can in the next page (Figure 9), one of them has to be sacrificed in order for the other ones to be at their best. Some are secure and decentralised, but not scalable (ex. Bitcoin), some are secure and scalable, but not decentralised (ex. EOS) and some are decentralised and scalable, but less secure (ex. VeChain).





Source: own work.

That's why there are different types of blockchains, each of them with different strengths and weaknesses, depending on which benefits they want to provide to their users and limitations they try to overcome. The majority offers functionalities that are similar to Ethereum, with some differences, mostly on the scalability side, which has been a major problem for Ethereum due to increased volumes that the network was not able to handle.

Even if blockchain technology has a huge potential, it still has some weaknesses, which need to be worked out for the future. There can be substantial technology costs to maintain them and the transactions per second can be much lower compared to centralised alternatives, together with the problem of the limited data storage. Some issues could also arise from future regulations, as they could prevent their development, in case governments will not be able to implement a supportive regulatory system. Another problem to be addressed could also be illicit activities that can happen on them because of their permissionless nature (Hayes, 2022b).

Besides that, there are other problems that will have to be addressed with the growing adoption of this technology (Javatpoint, n.d.). One of them is the lack of awareness and knowledge: even if the usage and use cases are growing, most of the people still doesn't know what that technology can do or is not capable yet to use it properly. Because of that, many problems can arise, like users losing assets due to poor choices in terms of security or even knowledge on how to use it properly. This leads to another problem, which is the lack of technical talent, that could be implementing solutions using blockchains, which is why investments in education should be made in order to fill the gap. A limitation could also be the immutability, which in some cases could cause some problems, like a processed transaction that was done by mistake. We then have the problem of scalability, as previously mentioned, which could harm the possibility to see the technology be utilized on a worldwide scale. Lastly, there is the issue of blockchain consensus mechanisms (how the user base of a

blockchain decides), as some of them like proof of work can be time and resource consuming and not sustainable.

As we have seen, there are still some limitations to overcome and improvements to do, but there are still tons of use cases that this technology could make a revolution.

### 2.3 Blockchain influence on the future

We have already mentioned that blockchain technology has been growing in its adoption, with the last two years that have shown an even bigger spike.

Starting with Bitcoin, which has seen its market capitalisation rise, not just as a payment method, but mostly as a store of value. A reasonable investment not just for an individual, but for companies (and even countries).

Some businesses have started adding it to their balance sheet. An example is MicroStrategy, a business intelligence, cloud base service and mobile software American company They started accumulating bitcoins, mostly due to their CEO Michael Saylor, a strong Bitcoin supporter, with their unutilized cash reserves (and later on even with debt), as an inflation edge and store of value. So far, they have been able to accumulate a total of 129,218 bitcoins (as far as May 2022), with the number that is probably going to grow in the future (CoinGecko, n.d.).

There are also countries that have started doing that. El Salvador's government, guided by their president Nayib Bukele, made Bitcoin legal tender within the country. They have started accumulating bitcoins, with many purchases that have already been made. But there were many more reasons behind El Salvador's interest in Bitcoin as a currency, which are the same as many less developed countries face:

- Be less dependent from the US dollar
- Reduce the amount of underbanked people
- Increase the efficiency in international remittances

Many companies were sceptic about it in the past, but changed their mind (Jackson, 2021): JP Morgan, Goldman Sachs and PayPal, are now investing in blockchain solutions and offering cryptocurrencies to their clients. Many companies are already using blockchain technology for other purposes: Gucci to fight against counterfeiting, Alibaba and Walmart for the traceability of their supply chain or IBM which provides business level blockchain platforms for their customers (Binance, 2021).

Going back to the technology itself, we have already mentioned that the worldwide spending into blockchain solutions keeps growing from 0.96 billion in 2017 to a forecast of 19 billion by 2024 (IDC, 2021).

Most important, in 2021 we also experienced the first IPO of a cryptocurrency exchange, Coinbase, which just a few years back would have been something impossible to think of (Relander & Chavarria, 2022).

Blockchains like Ethereum have presented some of the best use cases of smart contracts (for now): NFTs, DeFi, dapps and cryptocurrencies are just the beginning of a revolution that is currently taking place. Besides Ethereum, which is the most popular programmable blockchain, many new blockchains have been created, such as: Avalanche, Fantom, Tezos and many more. Each of them has new or improved features with user bases that are rapidly growing. But at the end, blockchain technology will be able to solve issues of trust, provide a transparent method to exchange information and value, a decentralised, secure and trusted peer-to-peer network between users (O'Rourke, 2022).

### **3 BRAVE BROWSER AND BAT**

We will now present Brave, the browser, ecosystem and advertising model. We will start with an introduction of the project, its elements and their token, in order to gain an overall understanding of why this project exists and what it is trying to accomplish.

The Basic Attention Token whitepaper, written by the Brave software team, starts with a provocative statement: "Digital advertising is broken". The report represents an overview of all the elements that make it possible to have a solution where all the stakeholders are empowered, without a middleman exploiting their presence online. It was first published in 2017 and updated in February 10, 2021, written by Brendan Eich (founder of Mozilla and creator of JavaScript), Brian Bondy and their team. It is a long presentation that explains what were the reasons behind the development of Brave browser and how they are trying to solve the current problems in online advertising and web browsing, looking to improve the efficiency, security and fairness of the digital advertising space through blockchain technology (Hayes, 2022a).

#### **3.1** About the project

The project itself has a simple structure. It is composed (Hayes, 2022a) by an open-source, privacy centred web browser, called Brave browser, and a native token, built on the Ethereum blockchain, called Basic Attention Token (or BAT). These two components connect the stakeholders in the digital advertising relationship, creating a new ecosystem where each of them is empowered.

As we mentioned early on in the thesis, there are three interconnected stakeholders in digital advertising: advertisers, users and publishers. Each of them has of course different reasons why is online, different needs and different concerns:

- Advertisers pay to showcase ads to users, looking to persuade them and let them make a specific action;
- Publishers want to monetise their user base: many do that through online ads from advertisers that are shown on their websites, which are targeted to their user base;
- Users are browsing online and following their favourite publishers: while doing that, they are targeted by ads from advertisers.

This system worked well until different problems arised, which negatively affected their overall experience: many middlemen in between them, complex tracking systems, shady data management, many privacy violations and malvertisement, lower revenues, slow page loads and much more. Each of these problems, directly or indirectly, affected all of them and the relationship they have with each other (Brave Software, 2021a). There was the need for a solution that would protect users, empower advertisers and fairly reward publishers, so the Brave team came up with the idea presented below (Figure 10).

In their model, the point of contact between advertisers, publishers and users is the browser. Basically, users use it to navigate the web, advertisers advertise on it and publishers monetise their content through it. This image (Figure 10) could seem similar to the one about Google in the first chapter, but there are some major differences: users have more control and are rewarded for their attention. Because of that, advertisers can achieve better results, as users don't feel exploited. Users can then directly reward publishers for their content, with the BATs that users earn watching the ads.

The BAT tokens serve as a medium of exchange between stakeholders (Bybit Learn, 2021). They allow the elimination of intermediaries that didn't provide any added value to users, advertisers and publishers in the past. These intermediaries were the main cause of many of the problems stakeholders experienced in recent years, such as high costs, privacy concerns and security issues (Ponpase, n.d.).



Figure 10: The Brave stakeholder ecosystem

Source: Brave Software (2021a).

BAT tokens have different purposes in the Brave ecosystem:

- They are earned by users for their focused mental attention to ads (which they have to accept receiving beforehand) and can be either stored or used as a tipping method for publishers through a private and secure experience with relevant ads, while receiving part of the shared profits for it (Brave, n.d.);
- Advertisers can use the tokens to pay for having their ads displayed on the Brave browser network, so they can access a channel that allows them better targeting, less fraud, better attribution and higher ROI;
- Publishers can receive the tokens from users as an alternative, more efficient revenue stream with a transparent reporting system, so they can achieve higher profits monetizing their content.

It represents an opt-in, rewards-based model to monetise the web, where the users' data is safe and protected, their time is valued and the attention is rewarded, rather than exploited (Brave, 2022b). In that way, all the stakeholders are incentivised to support the network and act in its best interest, as they all benefit from it.

The main pillar of the project is the web browser, which is completely free. However, the Brave team was able to diversify their offering with other services, like Brave Talk (privacy centred video calling), Brave Search (an independent, private search engine), Firewall and VPN subscriptions, a cryptocurrency wallet (an extensionless crypto wallet conceived for Web3), personalised news feeds and much more.

Brave monetizes their users through the browser with banner ads, cross selling subscription fees for some of their services, affiliate commissions and an online store (Viktor, 2022):

- Banner ads represent still the majority of Brave's revenue. The ads are opt-in, so users have to accept them and can decide how many they want to receive. If ads are enabled, users receive 70% of the ad revenue in the form of BAT tokens. The remaining 30% goes to the Brave team.
- Affiliate deals are present on the browser homepage, where different partners have affiliate deals offered to Brave users. Brave's revenue from it is in the form of a commission on the clicks that they achieve. Besides that, there is also a offers section, where partner products are offered at a discounted price.
- Another revenue stream is represented by all the services offered as subscriptions, like the Firewall and VPN or the video conferencing service Brave Talk.

The main reason behind the Brave ecosystem's growth is their main product, the Brave browser, which is presented as a better, more efficient solution to browse the web, while BAT tokens represent a better medium of exchange between stakeholders. Their team was able to innovate the traditional digital advertising space, transforming the interactions between stakeholders so they became mutually beneficial: users, publishers and advertisers can have the same benefits and no negative influence on each other, with no intermediaries that influence their relationship (Ponpase, n.d.).

Having said that, there are some critics about the browser and the overall model (Cogipas, 2020). Talking about the browser, some users have been complaining about the lack of extensions compared to other alternatives like Chrome, together with the fact that many tools and additions are still in beta phase. A few have also noticed the browser to be working less good or with limited functionalities on certain devices. Moving to the overall model, some have pointed out that this advertising model could undermine the sustainability and profitability of publishers that depend solely on paid ads to be able to create and publish content. All the users that will move to this model could represent a share of revenues that is lost forever. Another recurrent critic is that they are accused of doing the same as the big tech giants did years ago, proposing a model where they have their own ad network, blocking all the ads that are not from their model. Besides that, it will be also important to see how and if the Brave team is planning on decentralising of the overall model and how they plan to implement it (Ivankov, 2021).

#### 3.2 The Brave browser

As mentioned earlier, the browser is the backbone of the project (Viktor, 2022). It is an opensource, privacy centred and free online browser, which lets users navigate websites, execute web apps and consume online content, launched in 2016 (Bhatt, 2022). It was originally developed to offer a better alternative to solutions like Google Chrome or Mozilla Firefox, as it offers many improvements, such as enhanced privacy, no tracking, better performance and increased security, which makes it a really appealing option for tons of users, which were tired of underperforming, centralised alternatives, that didn't value their attention.

The Brave browser, similar to other ones, is simply a software application that grants access to the World Wide Web. Its job is to send the request to the server where all the content of a website is stored when a user accesses a website, which is then displayed as a "normal" website (Bodnar, 2021).

Brave browser's value proposition was deeply rooted in offering users an enhanced experience on the web, with a strong focus on privacy, which has been a big pain point for users online in the last years due to centralised operators that didn't value it as much as they should have been (Viktor, 2022). It employs an unusual business model: they completely blocked ads from websites, replaced them with their own ads (while sharing the revenue with users who look at them), where users can then tip the creators, they like directly through the browser (Keizer, 2021).



#### Figure 11: Online privacy by default: Brave vs. other browsers

Source: Brave (n.d.).

The browser itself has been developed by the Brave team. It is built on Chromium (Bhatt, 2022), which is an open-source project maintained by Google, used by other browsers as well, like Opera and Edge. It is available on Windows, Linux, macOS and Android, so both on desktop and mobile and was initially using the Google search engine, which was then replaced by default with their native search engine, called Brave Search, in October 2021 (Viktor, 2022).

Brave browser is one of the most popular and widely accepted examples of so called "blockchain browsers". Those are called that way because they natively support Web3 technologies (like blockchains, crypto wallets, decentralised applications...), looking to bridge the gap between the centralised Web2 and the decentralised experience advocated by Web3 supporters (Brave Software, 2021b).

The Brave browser has some key features that differentiate it from other alternatives available online (Bybit Learn, 2021):

- Private: it doesn't track user's movements across the web, cookies, scripts and crosssite trackers are blocked with an anonymised network model; all the browsing data gets deleted after each browser closing and no data is stored on Brave servers without permission;

- Secure: it is one of the safest browsers on the market. It blocks privacy-invasive trackers and ads, third party data storage, protects from browser fingerprinting, phishing and malwares, upgrades webpages to secure https connections and much more. Besides that, it is open source, so there is a whole community working on it to make is as good as possible.
- Free: the browser itself is completely free for every user;
- Rewarding: users are able to monetise their attention, which was once exploited by companies, as they used their data to provide ads services to advertising clients. Users focused mental attention is valued, as they get a share of revenue of the ads they choose to view, rewarded in BAT tokens through Brave Rewards;
- Fast: it blocks by default all the tracking, the ads and all the intrusive scripts that slow browsers, which translates into a faster and more efficient experience, less battery consumption and data usage. The Brave team claims that its browser loads pages three time faster than Google Chrome (Keizer, 2021);
- Simple to switch: all the bookmarks, passwords and extensions can be easily imported from old browsers to Brave; most of the Chrome extensions are also available on Brave.



Figure 12: Monthly active users using Brave browser (in millions)

As we can see from the graph above (Figure 12), the monthly active users (or MAU) keep growing, as all the features mentioned above allowed the Brave team to develop a solution that could easily differentiate from other alternatives on the market, together with the increase of popularity of blockchain, cryptocurrencies, Web3 innovations, increased adoption and bitcoin price increase that supported the growth. A lot of interest came also from the users looking outside the blockchain space, that were looking only for a safe, ads-free and more efficient alternative browser.

The browser is the first step for any user to enter in this ecosystem, which is why it is important that if offers attractive features, the usage is simple and it is perceived as a useful alternative to the browser they are using before switching. This is why we will be asking
active users to assess its perceived usefulness, usage and overall experience with it, in order to understand if it still has some limitations.

We will also try to analyse what's the share of the overall sample of respondents, that is either an innovator or a blockchain and cryptocurrency user, in order to understand at what stage of the technology adoption curve the Brave browser is at the moment. Based on Çakırca (2022) definition, it "demonstrates how different people ranging in demographics and psychological characteristics adopt and react to new technologies and innovative products", which could be an interesting insight to present, especially for its future adoption.

### 3.3 BAT tokenomics

Brave first launched their service using bitcoins to incentivise users to start using the platform. Later on, they realised growth was affected, as users kept the received bitcoins rather than use them to tip publishers to fuel the whole ecosystem.

This was one of the reasons, together with the need to raise new funds for the further project development, that in 2017 Brave issued their native currency through an initial coin offering (or ICO), which managed to raise \$35 million in a record time of less than 30 seconds (Viktor, 2022). When BAT was launched, they removed bitcoins as a medium of exchange between the stakeholders as a way to boost the system, improve the efficiency and prevent frauds, broadening their support to other creators and publishers on other platforms, like Twitch and YouTube.

The BAT token is built on the Ethereum blockchain as an ERC-20 token, and its whole name is Basic Attention Token. The token is the asset that powers a new blockchain based digital advertising ecosystem: in this ecosystem, users, publishers and advertisers use it as a medium for value exchange (Coinmarketcap, n.d.). It has a maximum supply of 1,50B BATs and a circulating supply of roughly 1,49B tokens (on day 01.06.2022) (Coinmarketcap, n.d.).



Figure 13: BAT price graph (2017-) on day 01.06.2022

Source: Coinmarketcap (n.d.).

As we can see from the price graph (in US dollars) in the previous page (Figure 13), the price, as any other asset, is determined by demand and supply. With a supply that is fixed at 1.5 billion tokens, each spike in adoption usually translates into a price increase. But this is not always the case, as many other aspects can influence the price, like huge selloffs, positive or negative news about the project and other complications.

### **3.4** Creators on Brave

The Creators section on the Brave browser is destined to publishers and content creators online. Users can contribute money (in this case BATs) to their favourite creators through Brave: all they need to do is signup as a verified creator and collect the contributions they have received.

There was a bit of concern on the publisher side, as at the beginning Brendan Eich was advocating an internet without ads, which was not accepted well by publishers, as ads represent one of their main monetisation options. This is why they later on onboarded publishers in the system, introducing ads and offering bitcoins to join the platform (Keizer, 2021).

There are different channels where users can tip publishers. The ones that are currently available are:

- YouTube
- Twitch
- Publications (ex. on Twitter, Reddit...)
- Own websites

Being a verified creator allows publishers to earn more revenue while getting back some of the lost revenue they should have received from users that use ad blockers. Being rewarded with BATs represents a direct form of payment for their content, way better than ads monetisation, which goes through a middleman.

Users have the option to tip recurrently, setting up a number of BATs that is automatically distributed to the creators each month, or give one-time tips based on their own choice. Publishers have then the option to access their rewards on the Creators dashboard, and convert the tokens in another currency (or keep them as BATs).

On day 01.06.2022, there are more than 1,500,000 verified creators, distributed through different channels. The majority is on YouTube (almost 750,000), with Twitter as the second (almost 210,000) and Twitch as the third (more than 130,000) (BraveBat, n.d.). One of the most popular publishers registered as a creator on Brave is MrBeast, who has more than 50 million subscribers online (Bhatnagar, 2021). We can look at the overall growth and channels performance in the next page (Figure 14).



Figure 14: Channels and number of creators on Brave on day 01.06.2022

The actual rewards that the creators receive depend on the BAT price at the time they receive the tip. Higher the BAT price is, then higher the reward, in monetary terms, will be for the creators.

### 3.5 Brave advertising

Brave Ads were introduced in April 2019, as an opt-in, privacy preserving advertising alternative made for advertisers, where they could find users that would be willing to listen because in control over ads rather than exploited for their attention.

There were many reasons why a solution like this was needed: Magna conducted a survey with 1,005 responses, looking at the users' experience with traditional digital advertising (Brave, 2021). There were some interesting takeaways: the most important facts pointed out were the negative feeling about ad load (67%) and shady online tracking (70%). 67% of them felt bombarded with ads and 60% felt they are constantly tracked online. Another important fact was the importance of control: more control is preferred (79%), with 81% that would be willing to take positive actions like pay for content, support brands and spend more time online, only if they could control their ad experience.

These are just some of the issues Brave Ads is trying to solve, as they are completely different from traditional digital ads (Brave Help Center, n.d.):

- Brave Ads are opt-in and privacy-preserving. They are matched to users directly and anonymously on their device without the need for Brave to profile them. The personal data from each user stays on the device and never leaves the browser, with reports that are not linked to any identifiable individual or device. Traditional digital advertising providers exploit information such as behaviour, browsed pages and location and offer it to advertisers to target ads, while Brave doesn't.
- Users that decide to opt-in to Brave Ads are then rewarded for their attention with BAT tokens each time they view an ad. The tokens can be claimed monthly through

Source: BraveBat (n.d.).

Brave Rewards. The tokens received account for up to 70% of the revenue share, so Brave keeps only 30% of it.

- The received BATs can be used by users to reward publishers in a direct way, with no intermediary and with their privacy that is completely protected.
- Ads from Brave don't appear in an intrusive way on web pages, but as push notifications on the device, where users can either engage or ignore them.

Before moving forward, it is important to differentiate two platforms: Brave Ads and Brave Rewards. The first is meant for advertisers to advertise, while the second is for users to receive the rewards, but they work together in the same model.

As mentioned above, Brave doesn't collect any data about the users (to offer it to advertisers), as ad matching happens locally on the devices. The choice on which ad could be more relevant is based on the recent browsing activity. Then, using anonymous-but-accountable ad confirmation events, activities and performance are tracked, while keeping all the information private, so no tracking is following their journey and interests online. The platform is equipped with ledger data encryption for privacy-preserving analytics, which measures the behaviour and attention of the user while keeping complete anonymity and allows to calculate high-level statistics about ad usage without gaining insight about any specific user (Brave Help Center, n.d.).

Basically, the browser blocks all the ads on webpages and replaces them with private ads that reward users for their attention. Users can decide in advance how many ads they are willing to receive and how much information they want to disclose to brands. Ads are shown at the most optimal time, and users have the control over how many of them they want to receive, from 0 to 10, over specific time spans. It is possible for them to block all of them: pop-ups, sponsored image ads and sponsored news feed ads as well, and even if that case the browser is completely free (Brave, 2022a).

The system employs a machine learning model for ads matching, rather than using third party tracking, which has been exposed as a less effective alternative. They create machine learning models based on the data from the local device and other sources like pages that have been visited and search queries to understand customer interests and create an even more effecting advertising model with relevant ads. The system uses blockchain technology to anonymously and securely track user's attention, which is stored only on the user's device, so it stays private and anonymous (Hayes, 2022a).

For advertisers, the process is like this: they buy inventory on the Brave Ads server, which is then added to a catalogue delivered to the user: A catalogue version is distributed based on the country (determined by the IP address) and a user attention model in the browser, employed to select the ads in a non-intrusive way and propose them at the best time. Brave offers two privacy preserving ways for private ads matching, which are contextual advertising to match users based on interest and behavioural advertising to match users based on purchase intent (Brave, 2020):

- Behavioural: it focuses on the long-term browsing behaviour, for example the websites that are frequently visited, the search queries or the time (of focused attention) for specific types of content. Brave does that with a privacy-preserving purchase intent mechanism that leverages locally available data, which doesn't leave the device.
- Contextual: it considers the user-independent context of an ad. Because Brave uses a page-independent system notification, they propose ads based on the short-term browsing history of a specific user (with the downside that the user's commercial intent can't be tracked).

The only big limitation with this is the lack of data to understand a user's latent preferences and intentions, which are hard to track respecting privacy. For example, if a user is looking for a crypto exchange, it doesn't necessarily mean he wants to buy cryptocurrencies.

Brave started with simple pop-up ads, but then they increased the available ad formats. There are three main ad formats available for advertisers at the moment (Brave Rewards, 2022):

- Push notifications (as banner ads)
- Sponsored images
- Brave news

Push notifications pop-up randomly and are composed by the brand name, a short text message and a call to action, which leads to a landing page. Users that click on these ads receive BAT rewards, depending on their behaviour when landing on it. Ads are presented differently depending on the system they are displayed on (ex. Windows, Linux, macOS or mobile). They are mostly used for traffic, engagement and acquisition.

These types of ads have an average CTR of 8% (Brave Rewards, 2022). It is required that the brand name is either on the CTA or in the title. The system checks automatically if the landing pages are secure and have to match the brand, even if all the ads are reviewed by the Brave team before being launched online.

We then have sponsored images, which are displayed on a random basis when users open new tabs. The images are free of tracking and completely private. They are available on all devices and systems and are best for awareness and branding campaigns. They work similarly as billboards: they are displayed randomly to all users in a specific country, with no targeting of any kind. All images are approved by the team and are shown each 4<sup>th</sup> newly open tab. Sponsored image ads can also be turned off if users don't want to see them, losing the BAT rewards for it. The last format is represented by Brave news ads. They can have two formats, either as promoted content or display ads. The first is used to educate, inform or create awareness, while the second is best for demand generation and promotions. This work similar to display ads, so they are engineered for viewability and are made so advertisers pay only when they are viewed completely. Promoted content includes the content of the brand into the Brave News feed. All the promoted content has a recognisable badge, the brand name and an image. As all the others, users can disable promoted content at any time. Display ads are enabled by default, and are displayed in a sequential rotation in the news feed (from second position, then every fifth card). All of them feature a banner proportion image (300x250), with text that is composed by a title, a CTA and the advertiser's name. The targeting can be either geographical (so based on the country) or on the operating system of the device the user is using.

Costs are specified: ad rates start at \$20 CPM rate, with the reporting that can be based either on impressions or clicks. It is possible for advertisers to pay for campaigns with USD or BAT tokens, with prices that are based either on CPC or CPM. Push notifications cost either \$20 CPM or \$0.20 CPC, while for sponsored images and Brave news units \$20 CPM. The required budget to have a push notification campaign is \$10,000 or more for 30 days, while for a sponsored image campaign is \$50,000 per day. This represents a huge barrier to entry, as smaller companies can hardly spend budgets like this for advertising campaigns.

Advertisers have a reporting dashboard available, where they can look at different metrics, such as views (number of push notifications served), clicks (clicks that led to the landing page), dismissed ads (clicks to close the notification), 10-second visits (clicks that led to 10 second spent on the landing page), upvotes/downvotes (available on desktop, users can vote positively or negatively a specific ad), conversions (actions completed by users) and the brand lift (survey that measures the impact of the ads) (Brave Rewards, 2022).



Figure 15: Active Brave ads campaigns

Source: BraveBat (n.d.).

On figure 15 we can look at the active campaigns worldwide. As we can see, the trend in positive: new companies are joining the platform in order to test the effectiveness of those type of ads, so the number of campaigns keeps increasing.

We will now move to the empirical part of this master thesis, looking to find data that could help us answer all the research questions we have planned for this thesis.

# 4 EMPIRICAL STUDY ABOUT BRAVE

In the theoretical part of the thesis, we introduced the concept of digital marketing, web browsers and the importance of blockchain as well as the transition from Web 2.0 to Web 3.0. The Brave chapter was intended to introduce how the whole model works and how are connected the stakeholders: this was crucial so we could then develop the research in the best possible way, based on the resources that are available at the moment.

The fact that this is a new advertising model with a new technology, made it hard to retrieve any research papers that could help us and give some guidance on how to develop the research, as there are not many papers about the Brave ecosystem yet, which is why we addressed the research in the following way.

### 4.1 Purpose and goals of the research

This thesis is aiming to offer an insight into new digital advertising models that are emerging, moving from Web 2.0 to Web 3.0, talking about how digital marketing together with blockchain could offer a better experience to advertisers, users and publishers in paid advertising. As we mentioned earlier, the problems caused by middlemen have become an increased concern for them in paid advertising. Advertisers have experienced increased costs for advertising and a diminished effectiveness to assess their advertising campaigns, publishers have seen their revenue fall and users have experienced slow page loads, growing violations of their privacy and an increased data consumption when browsing online.

Brave, together with their products and overall ecosystem, proposes itself as an appealing alternative, where all the stakeholders could be empowered with a more decentralised structure. However, in order for it to happen, it needs to offer them a better experience, so that the network effect can grow and adoption can increase.

In order to make the thesis as complete as possible, so that it would be structured in a simple and understandable way, we started it with specific **research goals** in mind:

- Analyse how is the Brave solution different from traditional alternatives, both with their browser and advertising model;
- Compare the paid performance between traditional paid ads and Brave ads in order to present their effectiveness and performance;

- Gain a better understanding of what is the past and present experience users have had with both the browser and the ads on Brave, in order to assess their current and future adoption.

Based on the goals in the beginning, we developed different **research questions**, in order to gain some insights regarding the performance of this advertising model with Brave ads as well as understand what is the usage experience with the browser, mostly because they represent the main drivers of adoption:

- Is the paid advertising performance different between traditional advertising models over innovative solutions like Brave ads? If yes, is it better or worse?
- How did users arrive to Brave browser? What were the reasons? What would make them go back to the previous solution?
- Is Brave adoption just a matter of time or are there any other limitations with the browser or the advertising model?
- Would users recommend the browser with its advertising model?
- Does the fact that users receive rewards help in having the ads achieve a better performance?
- What's the current user base of the browser? Based on the results, what's its current and future possible adoption?

In that way, we were able to research if Brave ads are a paid advertising channel that performs well, so that advertisers can look at it as a valid alternative, as well as assess if using Brave browser is easy and provides a better experience, so that users can perceive it as an appealing alternative to other browsers.

# 4.2 Research plan and data collection

The research has been divided in two parts:

- The first part is about **Brave ads and their performance**, where we will present the results in terms of CTR and CPC from different Brave ads campaigns, together with a comparison of the performance with other paid ads alternatives;
- The second part is about **Brave browser and the experience users have with it**, where we will present the results from the survey with active Brave browser users, where we asked them about their past and present journey with it.

The Brave ads performance has been addressed with desk research on secondary, quantitative data already available about different paid advertising campaigns, both on traditional alternatives and Brave. First, we analysed three case studies from different companies advertising on Brave, available on the Brave website: Nexo, Etoro and Culprit. In order to gain a less biased overview, we then analysed secondary, real-world data from Bitstamp, which has been running ads on Brave and other channels for a while, to see what

were the results compared to traditional alternatives. Desk research with case studies has helped us understand, describe and evaluate, with a combination of quantitative and qualitative data, our research problem connected with the performance of paid ads on different channels (McCombes, 2022).

The channels where Bitstamp was advertising through paid advertising during the time span we analysed were Brave, Facebook, Instagram, Reddit, Twitter and programmatic advertising. Bitstamp has been using both Facebook ads, Brave ads, and other paid advertising channels for a while, which made it a perfect example to include to see how the performance changes using different digital advertising channels over time and if the Brave advertising model and their ads perform better than other alternatives. The data range we were able to get starts from August 1<sup>st</sup>, 2021 and ends on March 31<sup>st</sup>, 2022, which represents an 8-month range. It was retrieved from Bitstamp's Data Studio report, together with the outsourced performance marketing agencies they are working with. It was then adapted with Excel in order to present it in a more structured way, so that we could have a clearer look over the results. As we had already enough disposable secondary data to make conclusions, there was no need to gather new data through primary research to answer the research question of how a company's advertising performance changes using advertising solutions like Brave ads over centralised ones like Facebook ads or Twitter ads.

The indicators we have been using to assess the effectiveness of both Brave and traditional ads have been introduced when presenting digital marketing and paid ads. CTR and CPC have been widely used as a valid indicator to analyse the performance of digital marketing campaigns: some researchers, like Yang and Zhai (2022), have developed CTR prediction models in order to have a valid indicator to forecast the performance of digital advertising campaigns, while some other ones, like Shi and Li (2016), have used both CPC, which is an additional valid indicator to assess the costs that are connected with a digital advertising campaign, together with CTR, to develop machine learning prediction models for ads effectiveness. Summarizing, the first focuses on the costs, which are a crucial part of advertising, while the second focuses more on the performance aspect of the ads, and based on the already available papers, can be used as reliable indicator for the performance of paid ads campaigns.

We then looked at the experience users have with Brave browser: we did that by collecting primary, quantitative and qualitative data through a questionnaire, which has been delivered to active Brave browser users. We used simple random sampling, with the first question that was asking the respondents if they are active Brave browser users. Respondents had to answer yes to move further, as the mandatory sample characteristic was that they had to be **active users of Brave browser**, due to the fact that all questions were then based on that prerequisite. Responses from non-active users were not taken into account, as well as the responses from users that didn't give their consent to use the results in the research.

The survey has been designed to get a deep understanding of the browser through the eyes of active users that have been using it for a while, as they represent one of the main drivers of adoption of the browser, and subsequently the advertising model. It was composed by a combination of open questions, closed questions, and Likert scale assessments (inspired by the TAM model), in order to gather quantitative and qualitative data that could help us understand what is the experience with the browser and the ads from the experience of active users, based on what we found out in the previous chapters. It contained different kind of open and closed questions and was divided into 4 distinct sections:

- The **first part** was developed to assess the journey users have had with Brave browser. This part was composed by 4 closed and 2 open questions. In this section we were looking to understand the reasons why users switched to Brave browser, which browser they were using before, possible improvements and situations that would make them go back to their previous browser.
- The **second part** was focused on the ads on the Brave ecosystem. There were 3 closed and 1 open question. All of them were asking the users about their experience with the ads; how much they can earn in one month, to what extend is the reward influencing the fact that they check the ads and if they recall any brands.
- The **third part** was meant to gather data about the actual experience with the browser. We presented to the users 14 statements about Brave browser, all about their Brave browser usage, where users were required to respond using a 7-pointed Likert scale, with the following options: strongly disagree (1), disagree (2), somewhat disagree (3), neither agree or disagree (4), somewhat agree (5), agree (6) and strongly agree (7).
- The **fourth part** was meant to gather demographic data from respondents. It consisted of 5 closed questions: about their gender, age and location, as well as 2 questions to understand if they consider themselves crypto/blockchain users and technology innovators. This was done in order to understand if there are any differences between them or if there is a pattern in their user base. The respondents, even if they had to submit some of their demographic data, were still completely anonymous.

The questionnaire invite was posted on different Facebook pages, Reddit groups, and LinkedIn, in order to gather as many respondents as possible. We were able to gather some respondents from crypto communities and technology groups, as they represent a good place where technology early adopters can be found. The software we used for preparing the questionnaire, collecting the data and analysing it was Tally (www.tally.so), with the questionnaire that was available at this link: https://tally.so/r/3q0kOm. We've chosen this software because it is simple to use, allows customisable questionnaires and it is user friendly, both for the researcher as well as the respondent. The results have been then presented using Excel and SPSS.

Altogether, the questionnaire contained **10 questions about Brave**, **5 demographic questions and 14 statements to be rated based on a Likert scale** on Brave's usability, taking approximately 4 minutes to complete it. The questionnaire invite link was published

on 24.05.2022 and was available for 5 days. It was closed on 29.05.2022. The minimum required sample size was set to 50 respondents; however, we expected to exceed that number.

### 4.3 Research limitations

The first limitation we encountered was with the Nexo, Etoro and Culprit Brave ads results. As the performance we used was from Brave's website, it's hard to tell how reliable are all the results, as Brave could be biased in that sense, as it is in their best interest to show that ads perform well. In would have also been interesting to see if they have any examples of campaigns that performed poorly, so that there could be a comparison.

Another limitation we encountered was with the Bitstamp data. Some channels were paused during the months we analysed, which is why not all the data for all the channels is available for the whole span. This happened due to different reasons (change of copy, change of design, change of strategy...). Besides that, some of the channels, for example programmatic ads, had a shorter data range, as they were not used throughout the whole data set, which made them less accurate. Also, a few channels had more campaigns running through a specific month: for the purpose of this thesis, some of them were joined together to get a single result for each channel.

Then, even if the survey was aiming to grasp how is the overall experience with the browser, it is hard to consider all the variables that represent the overall experience with a software. It would have been interesting to have an actual usability test with some of the users, where they could have been performing some predefined tasks, in order to see where are the biggest difficulties. There was also a limitation with data collection, due to the fact that it is a privacy focused browser where users usually want to stay anonymous, which made it hard to reach them to let them fill the questionnaire.

### 4.4 Brave ads performance results

The Brave team collects case studies about their most popular campaigns and the results they achieved in order to showcase them to potential advertisers. We will present four case studies of companies that have used Brave ads (3 from Brave, 1 from Bitstamp), where we have analysed what were the reasons that lead them to try Brave ads and the performance they were able to achieve (Brave, 2022d). The cases are about:

- **Nexo**: which is a company that is connected with blockchain and cryptocurrencies, but not a traditional exchange;
- **Etoro**: which is a cryptocurrency exchange and a Bitstamp direct competitor;
- **Culprit**: which is not connected to blockchain;
- **Bitstamp**: which is a cryptocurrency exchange.

We have been able, based on the secondary quantitative and qualitative data, to introduce the reasons why those companies tried Brave ads and compare their clicks, views and the overall CTR achieved by their campaigns, in order to understand what is the performance of Brave ads and if it is a better or worse channel than traditional alternatives.

### 4.4.1 Nexo

Nexo is a regulated digital assets institution offering instant crypto loans, daily earning on assets and cryptocurrency exchange, providing their users high-yielding interest on their assets and instant access to cash (Nexo Help Center, n.d.). They represent an indirect competitor to Bitstamp, as they provide some similar services but also some different ones.

The company, having a user base that is really concerned with privacy, was looking to advertise their products and service in a privacy-preserving space, where ads were not exploiting user data to target ads. With Brave ads, they were able to assign content categories to their campaign for interest and contextual alignment, so they could target users without forcing into their privacy (Brave, 2022d).

In the campaign presented on the Brave website, they were able to cut acquisition costs by 20%, achieving almost 4,000,000 views and a little bit less than 600,000 click, representing a CTR of 15.8%, which is indeed a really good result, especially compared to traditional digital ads channels, where CTRs are much lower. Below, there are some of the examples of their ads on the Brave browser.



Figure 16: Nexo ads examples on Brave browser

Source: Brave.photos (n.d.).

### 4.4.2 Etoro

Etoro is an online brokerage that offers stocks, commodities and crypto trading, as well as a community for social trading, where users can share or copy investments strategies from more experienced investors and traders (Lielacher, 2022).

They were looking for an advertising alternative where they could reach their target audience (crypto and blockchain supporters, early adopters and tech savvy users) in a non-intrusive, opt-in way, where users accepted the ads beforehand and were actually interested to receive ads that could be relevant and interesting (Brave, 2022d).

They ran two campaigns, both with user ads and sponsored images, which jointly achieved a really good result of almost 10,000,000 views and close to 1,400,000 clicks, with a CTR of 13.5%. Besides that, they also experienced an increase of account registrations of 230% and different spikes in deposits. Below, there is an example of one of their sponsored image ads.





Source: Brave.photos (n.d.).

### 4.4.3 Culprit

Culprit is a niche producer of sustainable underwear and accessories with humorous and creative graphics, with headquarters in Los Angeles (Asch, 2021).

The company was not happy with Facebook ads, as they were competing for the same audience as every underwear company advertising there. Other companies could easily outspend them, even with less qualitative products, diminishing their margins and returns on investment (Brave, 2022d). With Brave ads, they were able to access a previously unreachable audience (as most of them were most probably using ad blockers), which was more engaged as they were targeted by privacy protecting ads, where they had the choice to accept them and were not forced to.

They were able to increase sales by 500% in the first two weeks of the campaign, as well as almost 1,500,000 views and close to 200,000 clicks, representing a CTR of 12.8%. Unfortunately, no ad examples from Culprit were retrievable.

The table below summarizes the results these three companies were able to achieve, presenting the clicks, impressions, and overall CTR.

	Nexo	Etoro	Culprit
Clicks	586,745	1,318,763	181,391
Impressions	3,723,640	9,759,886	1,422,529
CTR	15.80%	13.50%	12.80%
		(2022 1)	

Table 2: Brave ads results comparison from Nexo, Etoro and Culprit

Source: Brave (2022d).

#### 4.4.4 Bitstamp

We will now present secondary, real-world data from Bitstamp, the oldest crypto exchange worldwide, with a total of 4.4 million users in 2021 (Bitstamp, 2021), where we have compared their advertising results from traditional paid ads (ex. Facebook ads, Twitter ads...) and Brave ads, looking at how the overall impressions, clicks, CTRs and CPCs were different.

Bitstamp is a cryptocurrency exchange: a platform where users can register in order to buy and sell different crypto assets, like BTC or ETH. In order to increase their user base and brand awareness, they have been using different advertising channels. One of them was paid advertising, both with centralised alternatives like Facebook or Twitter, as well as innovative solutions like Brave. They did it in order to diversify their presence as well as test a different channel that has a user base similar to their target audience: blockchain supporters, early technology adopters, tech savvy users and cryptocurrency enthusiasts.

The table on the next page (Table 3) presents the results, in terms of impressions, clicks, CTR and CPC, divided by channel, with each of the tables representing one of the 8 months that have been analysed. We can see that there were some differences in terms of performance and costs in the Bitstamp campaigns: in August, five channels were employed, which achieved 18,976,403 impressions and 469,373 clicks. In September, the channels were the same, with the impressions that lowered to 16,041,814 together with the clicks which were 425,260. In October, programmatic advertising was introduced and the budget was increased, as the impressions for this month were 35,165,220 and clicks increased to 1,264,958. The budget in November kept increasing, ending with 152,318,985 impressions and 1,477,750 clicks, while in December the impressions slightly decreased to 145,750,969, with an increase in clicks to 1,754,696. In January, some campaigns were running jointly on Facebook and Instagram, with the overall impressions that lowered to 134,456,570 and clicks that reached the maximum amount at 2,128,517. In February, the budget kept decreasing, with impressions that lowered to 90,267,633 and clicks that went back to 914,500. In this month, Reddit ads and programmatic advertising were paused, which is one of the reasons behind the decrease. In March, single Facebook and Instagram campaigns were paused, remaining only with Twitter ads, Brave ads and joint campaigns on Facebook and Instagram. This month, impressions returned to the numbers in October (36,362,102), with 238,796 clicks overall.

		August			December							
Channel	Impressions	Clicks	CTR	Avg. CPC	Channel	Impressions	Clicks	CTR	Avg. CPC			
Twitter	4,915,736	40,755	0.83%	\$0.46	Twitter	60,921,915	494,037	0.81%	\$0.20			
Reddit	7,361,919	10,313	0.14%	\$1.02	Reddit	23,906,979	32,561	0.14%	\$1.32			
Instagram	1,275,205	2,698	0.21%	\$2.65	Instagram	16,044,722	4,076	0.25%	\$5.82			
Facebook	2,200,802	16,294	0.74%	\$0.75	Facebook	34,852,474	257,569	0.74%	\$1.07			
Brave	3,222,741	399,313	12.39%	\$0.08	Brave	6,212,005	963,439	15.51%	\$0.06			
					Programmatic	3,812,874	3,014	0.08%	\$5.66			
		September										
Channel	Impressions	Clicks	CTR	Avg. CPC	January							
Twitter	770,705	8,309	1.08%	\$0.37	Channel	Impressions	Clicks	CTR	Avg. CPC			
Reddit	7,163,639	9,658	0.13%	\$1.07	Twitter	62,541,059	409,398	0.65%	\$0.20			
Instagram	1,853,749	3,267	0.18%	\$2.98	Reddit	6,370,704	11,406	0.18%	\$1.11			
Facebook	3,497,348	22,685	0.65%	\$0.68	Instagram	17,142,747	32,095	0.19%	\$5.49			
Brave	2,756,373	381,341	13.83%	\$0.07	Facebook	35,162,902	165,216	0.47%	\$1.05			
					Brave	4,353,360	1,464,437	33.64%	\$0.03			
October				Programmatic	1,172,389	667	0.06%	\$6.83				
Channel	Impressions	Clicks	CTR	Avg. CPC	FB & IG	7,713,409	45,298	0.59%	\$2.66			
Twitter	3,096,600	29,306	0.95%	\$0.24								
Reddit	6,871,892	9,121	0.13%	\$1.16		Fe	bruary					
Instagram	4,440,525	6,811	0.15%	\$3.26	Channel	Impressions	Clicks	CTR	Avg. CPC			
Facebook	8,363,530	28,278	0.34%	\$0.89	Twitter	69,842,327	406,678	0.58%	\$0.20			
Brave	9,252,121	1,189,347	12.85%	\$0.08	Instagram	361,757	770	0.21%	\$4.94			
Programmatic	3,140,552	2,095	0.07%	\$4.42	Facebook	702,746	3,883	0.55%	\$1.00			
					Brave	2,191,783	434,574	19.83%	\$0.05			
		November			FB & IG	17,169,020	68,595	0.40%	\$2.46			
Channel	Impressions	Clicks	CTR	Avg. CPC								
Twitter	18,731,167	158,438	0.85%	\$0.25	March							
Reddit	26,317,177	35,446	0.13%	\$1.33	Channel	Impressions	Clicks	CTR	Avg. CPC			
Instagram	26,750,085	47,734	0.18%	\$5.59	Twitter	26,936,859	169,469	0.63%	\$0.18			
Facebook	70,250,717	201,626	0.29%	\$1.53	FB & IG	9,400,179	38,463	0.41%	\$2.55			
Brave	6,616,000	1,031,723	15.59%	\$0.08	Brave	250,640	30,864	12.31%	\$0.08			
Programmatic	3,653,839	2,783	0.08%	\$5.16								

#### Table 3: Bitstamp paid advertising performance

Source: Derived from Bitstamp data (2022).



*Figure 18: Comparison between share of impressions and clicks* 

Source: Derived from Bitstamp data (2022).

Based on the results, we prepared Figure 18, where we can compare the share of the impressions (over the total impressions) that have been achieved, as well as the share of clicks (over the total clicks) that the ads realized. As we can see, even if Brave ads were achieving less impressions compared to other channels, the share of clicks they brough to Bitstamp were predominant, with months like October where they achieved almost 90% of all the clicks from paid advertising.

We will now look at two tables summarizing the paid advertising performance results on different channels in terms of their CTR and CPC, in order to compare the numbers, they achieved and how did the costs differ.

					-			
Channel	August	September	October	November	December	January	February	March
Brave	12.39%	13.83%	12.85%	15.59%	15.51%	33.64%	19.83%	12.31%
Facebook	0.74%	0.65%	0.34%	0.29%	0.74%	0.47%	0.55%	x
Instagram	0.21%	0.18%	0.15%	0.18%	0.25%	0.19%	0.21%	x
Reddit	0.14%	0.13%	0.13%	0.13%	0.14%	0.18%	x	x
Programmatic	x	x	0.07%	0.08%	0.08%	0.06%	x	x
Twitter	0.83%	1.08%	0.95%	0.85%	0.81%	0.65%	0.58%	0.63%
FB & IN	x	x	x	x	x	0.59%	0.40%	0.41%

Table 4: Bitstamp CTR ads performance

Source: Derived from Bitstamp data (2022).

In the table above, we can look at the CTRs, divided by channel and month. As mentioned earlier in the thesis, the CTR is calculated by taking the clicks and dividing them by the number of impressions (the number of users that have actually looked at the ad). It represents a good measurement option to compare the performance of a paid advertising campaigns, as it can be calculated for all the channels in the same way. Looking at the CTR, Brave ads were much more effective than any other paid advertising channel. Their CTRs ranged from a low of 12.31% to a high of 33.64%, with an 8-months average performance of 16.99%. The second best performing paid ads were Twitter ads, which achieved an 8-month average CTR of 0.80%, which is still far from the Brave ads' performance. The worst paid ads were programmatic ads, which realised an 8-month average CTR of 0.07%.

Channel	August	September	October	November	December	January	February	March
Brave	\$0.08	\$0.07	\$0.08	\$0.08	\$0.06	\$0.03	\$0.05	\$0.08
Facebook	\$0.75	\$0.68	\$0.89	\$1.53	\$1.07	\$1.05	\$1.00	х
Instagram	\$2.65	\$2.98	\$3.26	\$5.59	\$5.82	\$5.49	\$4.94	х
Reddit	\$1.02	\$1.07	\$1.16	\$1.33	\$1.32	\$1.11	x	х
Programmatic	х	x	\$4.42	\$5.16	\$5.66	\$6.83	x	х
Twitter	\$0.46	\$0.37	\$0.24	\$0.25	\$0.20	\$0.20	\$0.20	\$0.18
FB & IN	х	x	х	x	x	\$2.66	\$2.46	\$2.55

 Table 5: Bitstamp CPC ads cost

Source: Derived from Bitstamp data (2022).

Above we can look at an overview of the ads' CPC, divided by channel and month. CPC presents a reliable way to assess the efficiency of paid ads, as it is calculated by taking the total campaign costs and dividing it by the number of clicks the campaign was able to achieve. We can use it to compare the average costs per click, in order to assess how costly each click was for different paid ads. From what we can see from the Table 5, Brave ads were also the most efficient channel. Brave ads CPCs ranged from a low of \$0.03 to a high of \$0.08, with an 8-months average cost of \$0.07. The second most efficient paid ads were Twitter ads, which achieved an 8-month average CPC of \$0.26, which is not that far from

the CPC from Brave ads. The most expensive ads were programmatic ads, which realised an 8-month CPC of \$5.52.

After going through Brave ads' performance results and the comparison with traditional paid ads, we will now present the results from the questionnaire, where we will be analysing what is the overall feeling towards the browser and the experience with it, together with some other findings from the research.

### 4.5 Brave browser survey results

With the survey research we were looking to understand what is the experience users have had with the browser (why did they start using it and how is the experience with it) and the ads (how many ads they receive, how much they earn from them, how important is the reward in the fact that they check the ad), as well as how easy it is to use the browser.

We collected a total of **198 responses to the questionnaire**. From all of them, the **eligible ones were 193**, due to the fact that 3 of them were from non-active Brave browser users and 2 didn't give their consent to use their results for the research. As mentioned earlier, we collected the responses with Tally and we will now present them using Excel. We will start with some of the main characteristics of the respondents that took part in the research.



Figure 19: Brave browser usage time

There were different types of users that responded to the questionnaire, based on the time they have been using Brave browser. The majority of them mentioned they have been using it more than 12 months (140 users, representing 72% of the total respondents), with 16% of them between 6 and 12 months and only 12% less than 6 months.

We moved forward looking at what is the share of users that considers themselves an innovator, meaning that they feel they are the ones trying new technologies, even if not

Source: own work.

perfect yet, in order to assess at what stage of the adoption curve Brave browser could be. There was a total of 156 innovators (81%), with 33 of them (17%) that didn't feel as innovators and 4 of them (2%) that didn't answer. After assessing the share of innovators, we looked at what was the share of users that felt they are into the cryptocurrency and blockchain space. Brave, in order to be accepted and adopted as a browser and an advertising model, will need people that are not from this space, as it is the only way to reach mass adoption. We found out that the share of users from the crypto and blockchain space (69%) is still pretty huge, but the share of "outsiders" is already quite big, with 53 respondents, which represent 27% of the total users that took part in the research, which are not into the space, and 4% that preferred not answer.

At the end, we presented to the respondents some generic demographic questions, which helped us understand what is the population that took part in the research. The first surprising discovery was the huge share of male respondents (82%) compared to the female counterparts (8%), with 3% that marked the option "Other" and 7% of them that preferred not to answer. Talking about the age of the respondents, most of them were included in the 20 - 40 category (74%), with 17 respondents (9%) under 20, 24 respondents between 40 and 60 (12%) and only one respondent over 60 (1). 8 respondents (4%) preferred not to answer this question.





The primary location shows that the majority of respondents were based in Europe (47%), with North America as the second most popular location (29%) and Asia the third one (11%). This is maybe less relevant in assessing the respondents, as it is probably due to the channels where users were reached, and not based on the actual higher share of users from Europe compared to other locations like North America or Asia.

Source: own work.



Figure 21: Location results



As we can see from Figure 22, before switching to Brave, the majority of the respondents was using Chrome (60%), followed by Firefox (21%), Safari (6%), Opera (5%), and Edge (3%). The remaining 5% was using other alternative browsers, not present in the choices. Numerous respondents mentioned that they have been using more than one browser simultaneously, based on specific needs they have, so if something happened with Brave browser, they would just start using only the other one. A total of 173 active users (89%) would recommend the browser to a friend, meaning that their experience with the browser and the advertising model is probably positive. There were only 15 users (8%) that would not recommend it and 6 of them (3%) that preferred not to answer the question.



Figure 22: Past browser

The respondents selected numerous reasons why they moved away from their previous browser (Figure 23). The main reason was that Brave respects privacy (89%), followed by

Source: own work.

blocks tracking (76%), Brave Rewards (74%), provides faster browsing (45%), it is distant from big tech companies (35%), open source (33%), crypto friendly (31%) and censorship free (26%). The less important reasons were the tor integration (20%), integrated services like Brave Search (17%) and subscription services like the VPN and firewall (6%). 21 respondents mentioned that the reason why they switched is that Brave browser has been suggested to them (11%), while 10 of them (5%) selected other alternative reasons.



#### Figure 23: Reasons for switching to Brave

Source: own work.

We then asked the respondents about possible events that would make them go back to the browser they were using before. We received different responses: the majority told us that a more intrusive tracking or a decrease in privacy levels (15) would make them look for another alternative. The second most frequent response was a loss of the trust in the company (12), the ad blocking removal (9), other better alternatives on the market (9), a decrease in the browser performance (9), the removal of rewards (8), the discovery of their data being sold to third parties (7) and the inaccessibility to specific websites through Brave (5).

In order to understand the experience users have with Brave browser, we presented them some statements about it, where they had to assess its usability, looking to find out if there are some limitations that could harm its adoption. As we can see from the Table 6, the sentiment on the usability was quite positive, with the majority of users that agree with the fact that the browser itself is quite easy to use and that there are no major problems with it.

However, there are some improvements that could be made in order to make it more accessible to less technical users, so that adoption could be facilitated, which is why we moved forward asking the users what they don't like about the browser, so that we could understand what are the pain points that could slow its adoption. The most recurrent issue users mentioned was about the process of claiming rewards (17), where users have trouble

receiving them or understanding how to do it. The second frequent complain was about the synchronisation between devices (9), followed by high RAM usage (8), low rewards (6), bad user experience (6), the fact that it's Chromium based (6), the mobile experience (4), compatibility issues (4), and the limited withdrawal options to receive the rewards (4). There were other complaints as well, but they were mostly based on specific, individual needs, with no other respondents that felt the same way.

	My browsing	Brave browser	Brave browser	Brave browser	Brave	I find it easy to	I find it simple
	experience would be	gives me greater	improves my	addresses my	browser	recover from	to get Brave
	worst without Brave	control over my	browsing	browsing	saves me	errors using	browser to do
	browser	browsing online	performance	needs	time	Brave browser	what I want
Strongly Agree	22%	34%	31%	45%	35%	21%	45%
Agree	28%	33%	32%	32%	25%	21%	38%
Somewhat agree	30%	18%	19%	17%	19%	18%	10%
Neither agree or disagree	16%	11%	17%	5%	14%	31%	4%
Somewhat disagree	2%	2%	1%	1%	6%	2%	0%
Disagree	2%	2%	1%	0%	1%	3%	1%
Strongly disagree	trongly disagree 2%		1%	1%	0%	4%	2%
					Brave		
		I need to check		I make	browser is	Brave browser	
		guides and FAQs	Interacting with	repeated	complex	frequently	I'm frequently
		often when	Brave browser	errors when	and	behaves in	confused when
	Using Brave browser is	using Brave	requires a lot of	using Brave	inflexible to	unexpected	interacting with
	frustrating	browser	mental effort	browser	use	ways	Brave browser
Strongly Agree	0%	0%	0%	0%	0%	0%	0%
Agree	1%	1%	2%	2%	1%	1%	1%
Somewhat agree	1%	2%	2%	1%	3%	3%	2%
Neither agree or disagree	4%	4%	2%	4%	5%	5%	3%
Somewhat disagree	4%	8%	6%	6%	10%	12%	10%
Disagree	27%	15%	14%	20%	28%	27%	35%
Strongly disagree	63%	71%	75%	67%	53%	51%	50%

#### Table 6: Usability assessment

Source: own work.

After completing the part on Brave browser's usability, we moved forward asking users about the experience with Brave ads. From all the users that responded to the questionnaire, 173 of them (90%) already received ads on Brave browser, while 12 of them (6%) never received them and 8 (4%) were not sure if they ever received them. We then asked the respondents how much BATs they received in the last month approximately (Figure 21), in order to assess what are the average rewards a user can expect using it. We found out that 116 users (60%) received less than 5 BATs in the last month, 41 users (21%) received between 5 and 10 BATs, 9 users (5%) between 10 and 15 BATs and 6 of them (3%) more than 15 BATs. From all the respondents, 21 of them (11%) haven't received any rewards, most probably due to the fact that disabled the ads option to have an ads-free browsing experience on it.





After that, we asked the users if they think that the reward in BAT tokens supports the fact that they check the ads and the results were quite interesting: half of the respondents (52%) feels like the reward supports the fact that they check the ads they receive, while 35 of them (18%) feels like the rewards don't influence their choice. The rest of the 57 respondents (30%) were not sure if the rewards were having any influence on their choice to check the ads while browsing on the browser.





Source: own work.

To provide a deeper response to the question, we looked at what brands or ads they recall seeing on the browser. The first thing we discovered is that the majority doesn't recall specific brands, but they recall that ads are usually crypto related (24). From all the brands that were mentioned, 79% of them were from the crypto and blockchain space: the top mentioned ones were Crypto.com (21), Nexo (18), Near (12), Brave (11) and Upland (10). From the remaining 19% of the brands outside the crypto space, the most popular ones were Chipotle (8), Ford (5) and Grammarly (4).

After covering the questionnaire results, we then decided to analyse them using SPSS, in order to see if there are any interesting findings that would be worth sharing, especially comparing different groups that took part in the research.

#### 4.6 Comparison of usability experiences by subgroups

In order to find out some more information from the questionnaire results, we used SPSS to compare the statements scores about the usability of the Brave browser based on groups divided by location, age, gender and usage time of the browser, in order to see if there are any major differences between the groups from the research or if we could find any interesting pattens in the groups. One limitation we had with analysing the results is that we were not able to gather the same number of responses for different groups of respondents.

		Vly browsing experience would be worse without Brave browser	srave browser gives me greater control over my browsing online	srave Browser improves my browsing performance	srave browser addresses my browsing needs	srave browser saves me time	find it easy to recover from errors using Brave browser	find it simple to get Brave browser to do what I want	'm frequently confused when interacting with Brave browser	make repeated errors when using Brave browser	Jsing Brave browser is frustrating	need to check guides and FAQs often when using Brave browser	nteracting with Brave browser requires a lot of mental effort	srave browser is complex and inflexible to use	srave browser frequently behaves in unexpected ways
	Mean	5.47	5.91	5.77	6.19	5.79	4.99	6.1	1.65	1.56	1.53	1.52	1.44	1.75	1.84
Male	Ν	159	159	159	159	159	159	159	159	159	159	159	159	159	159
	Std. Deviation	1.272	1.166	1.119	1.014	1.26	1.581	1.233	0.872	1.094	0.892	0.999	0.959	1.067	1.065
	Mean	5.31	4.87	5.44	5.31	5.38	5.44	6	2.37	1.69	1.62	1.62	1.63	1.94	1.81
Female	N	16	16	16	16	16	16	16	16	16	16	16	16	16	16
	Std. Deviation	1.078	1.455	1.263	1.537	1.088	1.263	0.966	1.628	1.078	1.204	1.258	1.258	1.436	1.377
	Mean	4.4	5	5.2	6.6	5.2	4.6	6.6	2	1.4	2.2	1.6	2	2	1.6
Other	N	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Std. Deviation	2.074	2.345	2.49	0.548	0.837	1.949	0.548	0.707	0.894	1.643	0.894	1.732	0.707	0.894
I prefer not to	Mean	5.15	5.31	5.77	5.92	5.08	5.31	6.46	1.92	1.77	1.46	1.69	1.46	1.85	2.15
answer	N	13	13	13	13	13	13	13	13	13	13	13	13	13	13
	Std. Deviation	1.068	1.653	0.927	0.862	1.553	1.109	0.66	0.954	0.927	0.519	1.182	1.127	0.987	1.625

#### Table 7: Gender analysis

Source: own work.

We had cases where one group was much bigger in comparison to others (ex. gender results) or some of them where a few groups had many respondents and the rest of them just a limited number (ex. locations results). This made it hard to have a fair comparison between different groups of respondents, as the one that were limited were most probably not that representative. In the tables we will present below, we need to bear in mind that for the first seven statements the most positive result is 7, while for last ones is 1. We did not take into

account the results of the respondents from the "I prefer not to answer" category as well as the ones that had less than 10 respondents.

As we can see from Table 7, where we retrieved the means and standard deviation results based on the gender of the respondents, we can see that the male counterparts agree more with what is positive about the browser and disagree less with what is negative, with just two exceptions where female respondents had a higher result. Based on the results from the rating of the statements, males have apparently less troubles using Brave browser than females.

		My browsing experience would be worse without Brave browser	Brave browser gives me greater control over my browsing online	Brave Browser improves my browsing performance	Brave browser addresses my browsing needs	Brave browser saves me time	find it easy to recover from errors using Brave browser	find it simple to get Brave browser to do what I want	'm frequently confused when interacting with Brave browser	make repeated errors when using Brave browser	Using Brave browser is frustrating	need to check guides and FAQs often when using Brave browser	interacting with Brave browser requires a lot of mental effort	Brave browser is complex and inflexible to use	Brave browser frequently behaves in unexpected ways
Less than 6	Mean	5.27	6.18	5.77	6.14	5.55	5.09	5.77	1.91	1.55	1.41	1.91	1.5	1.73	1.64
months	N	22	22	22	22	22	22	22	22	22	22	22	22	22	22
	Std. Deviation	1.42	0.958	1.066	0.941	1.438	1.54	1.688	0.868	0.8	0.666	1.231	0.74	0.985	0.79
6 months - 12	Mean	5.19	5.42	5.39	5.84	5.55	5.1	5.55	1.81	1.65	1.58	1.45	1.29	1.87	1.84
months	N	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	Std. Deviation	1.138	1.587	1.43	1.44	1.179	1.326	1.804	0.833	1.018	0.886	0.961	0.529	1.118	1.098
12 months -	Mean	5.21	5.67	5.66	6.07	5.67	4.81	6.19	1.9	1.8	1.73	1.66	1.71	1.81	1.96
24 months	N	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	Std. Deviation	1.318	1.236	1.089	0.906	1.305	1.662	0.889	1.194	1.325	1.048	1.115	1.331	1.183	1.148
More than 24	Mean	5.74	5.87	5.94	6.26	5.81	5.23	6.44	1.49	1.34	1.4	1.34	1.3	1.71	1.83
months	N	70	70	70	70	70	70	70	70	70	70	70	70	70	70
	Std. Deviation	1.188	1.284	1.115	1.073	1.231	1.496	0.673	0.756	0.832	0.858	0.849	0.84	1.009	1.215

Table 8: Usage time analysis

Source: own work.

We now move to Table 8, where we analysed the statements results based on the time users have been using the browser, looking to compare the results of the mean and standard deviations between them. As we can see from the results, the top results are in the group of users that have been using Brave browser for more than 24 months. In fact, it makes sense, as they had much more time to get used to it and understand how it works, while other groups have probably more trouble with it. It is also important to remember that users that have been using it for more than 24 months are most probably early adopters, which are usually much more skilled and technically capable to understand and master new technologies.

		My browsing experience would be worse without Brave browser	Brave browser gives me greater control over my browsing online	Brave Browser improves my browsing performance	Brave browser addresses my browsing needs	Brave browser saves me time	I find it easy to recover from errors using Brave browser	I find it simple to get Brave browser to do what I want	I'm frequently confused when interacting with Brave browser	I make repeated errors when using Brave browser	U sing Brave browser is frustrating	I need to check guides and FAQs often when using Brave browser	Interacting with Brave browser requires a lot of mental effort	Brave browser is complex and inflexible to use	Brave browser frequently behaves in unexpected ways
Furope	Mean	5.43 91	5.58 91	5.69 91	6.03 91	5.68 91	5.03 91	6.03 91	1.78 91	1.62 91	1.59 91	1.48 91	1.54 91	1.86 91	1.82 91
curope	Std. Deviation	1.156	1.317	1.161	1.1	1.219	1.602	1.303	0.987	1.093	0.943	0.947	1.099	1.121	1.081
North	Mean	5.57	6.23	5.64	6.32	5.71	4.96	6.23	1.68	1.48	1.39	1.38	1.3	1.57	1.86
America	Ν	56	56	56	56	56	56	56	56	56	56	56	56	56	56
America	Std. Deviation	1.076	0.934	1.197	0.936	1.331	1.525	0.874	0.855	0.991	0.593	0.885	0.658	0.931	1.135
	Mean	5.41	5.68	5.95	6	5.77	4.82	6.05	1.86	1.86	1.91	1.91	1.77	2.05	2.14
Asia	N	22	22	22	22	22	22	22	22	22	22	22	22	22	22
	Std. Deviation	1.501	0.894	0.844	0.873	1.378	1.296	1.362	1.32	1.424	1.509	1.306	1.445	1.362	1.39
South	Mean	4.5	5.67	5.5	6.67	6.33	5.17	6.67	1.33	1.33	1.83	2.17	1.17	1.67	1.5
America	N	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Std. Deviation	2.811	2.338	2.258	0.516	0.816	2.317	0.516	0.516	0.516	1.169	1.472	0.408	0.816	0.548
A contraction	Mean	4.2	6.2	5.8	6	5.4	6.4	5.8	1.6	1.6	1.4	1.2	1.2	1.8	1.4
Australia	N Stal Daviatio	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Sta. Deviation	1.643	0.837	1.095	1	1.14	0.894	2.168	0.894	0.894	0.548	0.447	0.447	0.837	0.548
Africa	N	2.5	3.5	0.0	4	2	2.5	2	1	1	1	1	1	1	2.5
Africa	Std Dovistion	2 101	2 526	2	4 242	2	2 101	2	2	2	2	2	2	2	2 101
	Mean	2.121	5.350	6.5	4.243	5 75	5.25	6	2.25	1	1	2.25	1.25	2	1.5
Other	N	4	1	4	4	1	1	4	4	4	4	4	1.2.5	4	1.5
other	Std. Deviation	0.816	0.957	0.577	0.577	1.5	0.957		1.258			1,893	0.5	1 414	1
	Star Deviation	0.010	0.557	0.377	0.377	1.3	0.557		1.200			1.000	0.5	1.414	1

Table 9: Location analysis

Source: own work.

In Table 9 we can look at the results of the location analysis, where based on the means and standard deviations, we can see that North America is the region where Brave browser is perceived simpler to use compared to other regions, with Europe and Asia that had the highest scores only with two usability statements each.

The last table we will present is the one below, showing the results of the analysis based on the age of the respondents. As we can see the, age group 20-40, which was also the most numerous one, achieved most of the positive results, compared to other age groups. We can see that the group of users below 20 achieved good results as well, with 4 scores that were the top ones between all the respondents. We can say that age looks like a facilitating factor in users' ability to understand and use the browser.

need to check guides and FAQs often when using Brave browser My browsing experience would be worse without Brave browser Brave browser gives megreater control over my browsing online frequently confused when interacting with Brave browser Brave browser requires a lot of mental effort to recover from errors using Brave browser Brave browser frequently behaves in unexpected ways find it simple to get Brave browser to do what I want Brave Browser improves my browsing performance repeated errors when using Brave browser browser is complex and inflexible to use Brave browser addresses my browsing needs Ising Brave browser is frustrating saves me time with browser easy nteracting find it ( make Ē 5 5.47 5.53 6 1.76 1.65 1.71 1.71 1.88 Mean 5.59 5.71 1.7 Under 20 N 17 17 17 17 17 17 17 17 17 17 17 17 17 17 Std. Deviation 1.323 1.586 1.505 0.97 1.502 1.16 1.541 1.033 1.32 1.213 1.359 0.752 1.317 1.2 Mean 5.45 6.16 4.92 1.5 1.8 20-40 143 143 143 Ν 143 143 143 143 143 143 143 143 143 143 143 1.287 1.036 1.171 1.164 1.012 1.216 1.61 1.196 0.867 0.985 0.804 0.862 1.041 1.034 Std. Deviation 2.13 2.25 Mean 5.79 5.58 6 5.21 5.08 5.96 1.87 1.96 1.87 1.5 2.08 40-60 24 Ν 24 24 24 24 24 24 24 24 24 24 24 24 24 Std. Deviation 1.18 1.179 0.929 1.022 1.285 1.316 0.859 1.454 1.393 1.334 1.513 0.933 1.213 1.482 Mean 4 7 1 4 7 1 1 1 4 1 7 1 1 1 Over 60 Ν 1 1 1 1 1 1 1 1 1 1 1 1 1 1 Std. Deviation 5.38 5.88 5.38 1.5 1.63 1.5 Mean 5.5 6 5.38 6.63 1.25 1.63 1.5 1.5 prefer not to Ν 8 8 8 8 8 8 8 8 8 8 8 8 8 8 answer 2.066 1.069 0.756 1.061 Std. Deviation 1.195 1.126 1.408 1.188 0.518 0.463 1.069 1.188 1.414 1.069

Table 10: Age analysis

We were able to gather more insights after analysing the results with SPSS; as we have seen, the most comfortable group with Brave browser, based on its usage, are male, North American users, aged between 20 and 40, who have been using the browser for more than 24 months. However, there are not huge differences between different groups, which points to the fact that usability is not an issue with Brave browser, even if there are some improvements that could still be made. We will now move to a brief discussion of the results and a few recommendations based on our findings.

#### 4.7 Discussion and recommendations

We have seen that the paid ads performance can vary a lot based on the channels that an advertiser decides to employ. The takeaway from the paid performance from Bitstamp is that Brave was the channel that performed best, as well as costed less. The number of clicks in respect to the number of impressions was really high, while the CTR was also much higher compared to other paid options, while the cost for an ad click was way lower, representing a really good advertising channel.

Source: own work.

Also, comparing the campaign results from Nexo, Etoro, Culprit with the ones from Bitstamp, we can see that the achieved CTR was in all the cases over 10%, which is way higher than the average CTR of other alternatives, like display ads and search ads, where their CTR is respectively 0.35% and 1.91% (CXL, n.d.). As we have seen, even if they are different companies working in different markets, they were all able to achieve high CTRs with Brave ads: this channel looks like an interesting alternative for a company that is looking to target a user base similar to the one from Brave. The companies we analysed tried this advertising model due to different reasons: respect the privacy of their users, test new channels or reach new audiences that were previously unreachable, but different reasons didn't influence the performance. One thing we have noticed is that Culprit, which is not a company connected with cryptocurrencies and blockchain, achieved the lowest result, looking at their overall CTR. The result was still good, but the lower CTR could be due to the fact that Brave browser's user base is less ready to receive ads that are not related to cryptocurrencies and blockchain, as most of the ads at the moment are currently related to those topics. This will probably be solved when the user base will become less homogeneous and the share of people outside cryptocurrencies and blockchain will grow.

Brave ads look like a really appealing option for any company that wants to try an untraditional, innovative channel, which requires higher initial investments, but performs way better than other cheaper alternatives. Even if Brave ads were not particularly performant, if we look at their impressions, where other channels like Twitter or Reddit were able to achieve higher numbers, the share of clicks accomplished by Brave ads over the total clicks was predominant. If we look at Bitstamp's case, in six months out of eight, Brave ads represented more than 50% of their total clicks, with months like October where they achieved more than 90% of the total clicks. So, if we look just at the clicks, especially based on the total impressions, Brave ads were the paid channel that realised most of the results.

If we then move to the questionnaire results, they presented a deeper insight into many aspects of Brave browser and its advertising model: Chrome and Firefox represent the strongest competitors in the browser market for Brave. Users moved away from them due to different reasons, mostly because with Brave they were able to have more privacy, no tracking on their browsing, rewards for their attention to ads and a better browsing performance. If these features would suddenly disappear, many users would probably stop using Brave browser and go back to the browser they were using before. We have to mention that many respondents said that they use more than one browser, so they can exploit the strengths of different ones simultaneously. We found out that the vast majority of active users would recommend the browser (89%), but there is a lack of awareness if the rewards they receive for checking the ads contribute to their intention to look at them, which is quite interesting. As we have seen from the results, the rewards a user can earn in one month are usually less than 5 BATs, which at the time of writing (02.06.2022) translates in roughly \$2. It would be interesting to see how the willingness to look at ads would change if rewards (or the price of BAT tokens) would increase.

Looking at the sample of active Brave browser users that took part in the research, we noticed that the share of innovators is still predominant but not the only one, as we are most probably in the early adoption stage, where not all of them are innovators, but there are other "early adopters" that are trying it, as they had some innovators testing it in the past. There was also a huge predominance of male users and respondents aged between 20 and 40 years. It would be interesting to look if the actual population is similar to the sample we had responding to the questionnaire and if yes, what are the reasons behind that. Also, the share of crypto and blockchain users as well as crypto ads is still pretty huge, which could represent as a limitation for Brave's future adoption, at least in the short term: adoption will be facilitated when there will be more examples to analyse outside of this market.

Talking about Brave browser's usability, there were no huge limitations that could harm the future adoption of the browser. Respondents find it quite simple to use, but there are still some improvements that could be made, like making the claim process and the synchronisation between different devices easier or working on lowering the RAM consumption when using the browser. We have seen that there are groups of users that are, due to their characteristics, facilitated to use Brave browser. However, the majority of respondents doesn't feel like the browser is complex to use and there are no big pain points that could influence their willingness to keep using it.

We have seen that the lack of extensions and tools in beta phase are not perceived as major problems, as just a few of them mentioned it (Cogipas, 2020). More respondents mentioned limited (or not working) functionalities as a major problem that should be addressed. The model seems interesting, but the fact that the users that move to it become unreachable to advertisers outside it could be a problem, together with the fact that it could undermine the sustainability of some publishers that depend from ads (the money they get from users using Chrome will be gone if they move to Brave). Another big problem, which has still to be addressed and is probably the most important, is how and in what degree the Brave team is planning to decentralise the project (Ivankov, 2021) in the future, as strong centralisation would make them be like Google or Facebook right now.

The overall advertising model looks like an appealing alternative for all the stakeholders. We have seen that advertisers can achieve much better results with Brave ads than with traditional paid ads. The publishers can have a direct and new revenue stream that costs them nothing, which makes it a good option based on the effort it requires to set up a creator account. The users can have a better browsing experience, where they are rewarded for their attention, their privacy is protected and the performance is better, with a browser that is not difficult to use and where they have much more control over their experience.

# CONCLUSION

This master thesis was aiming to present advertising models exploiting blockchain technology as a valid alternative to traditional alternatives that are still predominant in the market, both from an advertiser and user perspective.

We first introduced digital marketing and paid advertising, moving then to blockchain technology and cryptocurrencies and completing the introduction with a presentation about Brave, their browser, the token and the overall ecosystem, pointing out which are the differences between Brave and other alternatives that have been in the market for years.

We were able to compare the data from paid advertising campaigns from different companies, so that we could assess what's the performance of Brave ads, especially in comparison with alternatives that have a bigger advertiser base at the moment. The results we gathered have shown that, as an advertiser, Brave ads are a better performing paid advertising channel compared to traditional ads. Even if the number of impressions Brave ads received was much lower, from a CTR, CPC and overall clicks comparison, they were able to achieve better results, based on Bitstamp data. The data from Nexo, Etoro and Culprit just confirmed the CTR range Brave ads can achieve.

From a user's perspective, we found out that the browser is perceived as a valid alternative to mainstream alternatives, like Chrome or Firefox. The browser is the basis of the ecosystem and it is important for users to have a good experience with it so that the model can increase its stakeholders base. We've found out that even if the browser is valid, it still has some limitations that could be solved in the future. Besides that, its user base is still predominantly composed of blockchain users or innovators, which is why the user experience must get simplified so that less technical users can use it without any problems. What's important is that the vast majority recommends the browser and the advertising model, even if there is still some confusion about it, as many users are not aware if the rewards are supporting the fact that they check the ads. There should also be a broader selection of advertisers, especially from outside the blockchain and cryptocurrency space, so we could realize its potential for mass adoption.

The thesis results had some limitations: the ads analysis didn't take into account factors like the ads design or the copy, which are an important part of an ad. The data we compared was based on one company, so having more of them could have helped, especially in having a comparison between companies advertising both on Brave and traditional channels.

In conclusion, Brave's advertising model represents a quality alternative for advertisers that are looking to increase their paid advertising results in an environment where users are empowered to choose, and because of that, more open to ads. Users can decide to receive ads and are not forced to while being rewarded for it in case they accept them and without the fear of being tracked when browsing the web.

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APPENDIX

#### Appendix: Povzetek (Summary is Slovene language)

Namen magistrskega dela je bil predstaviti oglaševalske modele, ki izkoriščajo blockchain tehnologijo, kot potencialne alternative tradicionalnim rešitvam, ki še vedno prevladujejo na trgu, tako z vidika oglaševalca kot uporabnika. Začeli smo z digitalnim trženjem in plačljivim oglaševanjem, nato predstavili Bitcoin, blockchain tehnologijo in ostale kriptovalute ter zaključili z Brave modelom: Brave brskalnikom, BAT kriptovaluto in celotnim ekosistemom, pri čemer smo izpostavili katere so razlikovalne točke z drugimi alternativami, ki so trenutno na voljo. Analizirali smo katere so omejitve centraliziranih rešitev in kako decentralizirane alternative, kot je Brave, skušajo odstraniti te omejitve in ponuditi boljšo rešitev. Prav zaradi tega, smo potem primerjali uspešnost Brave oglasov v primerjavi s tradicionalnimi, ter preverili kakšno je mnenje uporabnikov glede Brave brskalnika: njegova uporabnost, omejitve, ter poprašali uporabnike, ali ga smatrajo kot dobro alternativo, predvsem v primerjavi z ostalimi brskalniki.

Rezultati oglaševalskih kampanj so pokazali, da so Brave oglasi uspešnejši od tradicionalnih oglasov: pri Bitstamp primeru so dosegli nižje število prikazov (angl. impression), so pa beležili najboljše rezultate glede na število klikov, CTR in CPC. Podatki Nexo, Etoro in Culprit kampanj so potrdili razpon CTR rezultatov, ki ga običajno dosežejo Brave oglasi.

Z vidika uporabnika smo ugotovili, da je brskalnik dobra alternativa drugim brskalnikom, kot sta lahko Chrome ali Firefox. Brskalnik je baza celotnega ekosistema, prav zaradi tega je pomembno, da imajo uporabniki kvalitetno izkušnjo, da se lahko število uporabnikov modela poveča. Ugotovili smo, da tudi če je brskalnik dober, ima še vedno nekatere pomanjkljivosti, ki se bi jih lahko odpravilo. Baza uporabnikov še pretežno stavljena iz blockchain uporabnikov in inovatorjev, zato je ključnega pomena poenostavit izkušnjo, da lahko brskalnik nemoteno uporabljajo tudi manj tehnični uporabniki. Pomembno je, da večina razume in uporabi brskalnik in oglaševalski model, čeprav je glede nekaterih točk še nekaj nejasnosti, saj se veliko uporabnikov ne zaveda, ali nagrade podpirajo dejstvo, da spremljajo oglase.

Skratka, Brave oglaševalski model predstavlja kakovostno alternativo za oglaševalce, ki želijo povečati rezultate plačanega oglaševanja v okolju, kjer imajo uporabniki možnost izbire in so zaradi tega pripravljeni sprejemat oglase. Uporabniki imajo možnost izbire in niso prisiljeni sprejemat oglase, so pa za sprejemanje nagrajeni, ne da bi bili v strahu, da jim kdo sledil pri brskanju po spletu.

#### **Appendix 1: Brave Browser Questionnaire**

### 1 Part

1. Are you using Brave browser? Yes/No

to me/Other

- 2. How much time have you been using Brave browser? Less than 6 months/6 months-12 months/12 months-24 months/More than 24 months
- 3. Which were the main reasons that made you switch to Brave browser? Respects privacy/Open source/Blocks tracking/Censorship free/Faster browsing/Distant from big tech companies/Tor integration/Brave rewards (BAT for your attention)/Subscription services like the VPN and firewall/Integrated services like Brave search/Crypto friendly (integrated crypto wallet...)/It has been suggested
- 4. Which browser were you using before Brave browser? *Chrome/Safari/Edge/Firefox/Opera/Other*
- 5. Would you suggest Brave browser to a friend? Yes/No/I prefer not to answer
- 6. Is there something that you don't like about Brave browser?
- 7. Is there any event or update that would make you go back to the browser you were using before?

# 2 Part

- 8. Have you ever received ads on Brave browser? *Yes/No/I'm not sure*
- 9. How many BATs were you able to get as a reward in the last month approximately? Less than 5 BATs/Between 5 and 10 BATs/Between 10 and 15 BATs/More than 15 BATs/None
- 10. Did the reward in BAT tokens support the fact that you checked the ads? *Yes/No/I'm not sure*
- 11. Do you recall any brands on the ads?

# 3 Part

(1 strongly disagree - 4 neither agree or disagree - 7 strongly agree)

- My browsing experience would be worst without Brave browser
- Brave browser gives me greater control over my browsing online
- Brave Browser improves my browsing performance
- Brave browser addresses my browsing needs
- Brave browser saves me time

- I'm frequently confused when interacting with Brave browser
- I make repeated errors when using Brave browser
- Using Brave browser is frustrating
- I need to check guides and FAQs often when using Brave browser
- Interacting with Brave browser requires a lot of mental effort
- I find it easy to recover from errors using Brave browser
- Brave browser is complex and inflexible to use
- Brave browser frequently behaves in unexpected ways
- I find it simple to get Brave browser to do what I want

#### 4 Part

12. Do you consider yourself an innovator in the technology space, meaning that you are always open to trying new technologies, which are not perfect yet, in order to contribute to their improvement?

Yes/No/I prefer not to answer

- 13. Do you consider yourself a crypto trader/investor/expert or blockchain user? *Yes/No/I prefer not to answer*
- 14. What gender do you identify as? Male/Female/Other/I prefer not to answer
- 15. What is your age? Under 20/20-40/40-60/Over 60/I prefer not to answer
- 16.
   Where is your primary residence?

   North
   America/Central

   America/Europe/Africa/Asia/Australia/Other/I prefer not to answer
- 17. I give my consent to use my response I give my consent/I don't give my consent