Consumer-centric advertising solutions; the panacea or fata morgana to all advertising worries?

Written by:
Jeroen Mutsaers
S2608472

Master of Science Thesis
November 2022

First supervisor: dr. A.A.C.G. van der Graaf
Second supervisor: dr. J. Karreman

Words: 12809

University of Twente
Faculty of Behavioural, Management and Social Sciences
Drienerlolaan 5
7522 NB Enschede

Abstract

Background. With data breaches like the Cambridge Analytica scandal, internet users tend to have insufficient trust in online advertising intermediaries like Google and Facebook, and look for alternatives that put forward different online privacy and security standards, particularly, blockchain. Increasingly organizations can be detected that provide advertising solutions such as web browsers, that collect less personal data from internet users and provide more user-relevant ads. Since many organizations investigate alternative advertising solutions, examining the intention of internet users is essential.

Research goal. Research on applications that make use of blockchain technology in marketing is scarce. Current literature does not elaborate on the blockchain marketing integration and particular to alternative advertising solutions. Literature suggests that internet users are not familiar with or fail to understand blockchain technology and digital tokens, which likely decreases the level of trust in this type of solution. However, it has never been investigated if these adoption barriers exist. Thus, the goal of this research is to develop a model that explains the adoption process of a blockchain related marketing solution.

Methods. Central in the context of this study is the consumer-centric advertising solution Brave**.** An online survey (N=223) was conducted to study the intention of Dutch internet users to use the Brave web browser. This was done by investigating how performance expectancy, effort expectancy, hedonic motivation, social influence, perceived trust, perceived security and perceived risk influence behavioural intention. A regression analysis and the Hayes process Macro v4.0 was applied in SPSS.

Results. Effort expectancy, social influence and perceived security had a positive significant effect on behavioural intention. Perceived risk had a significant negative effect on behavioural intention. Moreover, social influence had a significant positive effect on perceived security. This while perceived risk had a mediating effect on the effect between perceived security and behavioural intention.

Conclusion. This study contributes to the gap related to the blockchain marketing integration and alternative advertising solutions. Currently, Dutch internet users do not have the intention to use the Brave web browser. However, due to the increasing importance of perceived security and the influence of their social environment this is expected to change long term.

Keywords: UTAUT, perceived security, online privacy, online advertising, social influence, behavioural intention

Table of Contents

1. Introduction

Online advertising connects hundreds of thousands of advertisers, publishers and users daily, making for a vital and complex ecosystem with different intermediaries (like Google and Facebook), internet users, advertisers and publishers (Pastor Valles, 2016). The current advertising ecosystem is designed to particularly benefit the middlemen or intermediaries which can be seen to predominantly function as a single authority and controller over the tracked advertising data and ad placement. In this view, unsurprisingly, advertisers are concerned about ad fraud and misplacement, publishers about their decreasing share of advertising budgets and internet users about their privacy (Kotila et al., 2016; Davies, 2017; Tynan, 2020).

With previous data breaches in recent years, like the Cambridge Analytica scandal (Facebook) and the Google+ bug in 2018 (Hongwei & Peiji, 2011; Business Insider, 2021), as a result, the trust of internet users in these intermediaries has suffered. With more alternatives at hand, some internet users are investigating such services as alternatives to these intermediaries (Bleier & Eisenbeiss, 2015; Leong et al., 2020; Business Insider, 2021). In addition, the number of online ads is on the rise because the number of advertisements displayed to internet users is also increasing (Bleier & Eisenbeiss, 2015; Leong et al., 2020). According to Statista (2022), the number of online ads will increase, and it is estimated that digital advertising spending worldwide will be around $876.1 billion by 2026 (from . around $602.02 billion worldwide in 2021). The current practice of increasing advertising spending worldwide seems for intermediaries to provide advertisers with the possibility to 'throw a dozen advertisements in the air' at internet users, hoping one will hit the target. This means internet users tend to be flooded with advertisements which likely decreases the effectiveness of online ads, browsing speed (e.g., page load) and the browsing experience overall. For example, research by the Lumen firm has shown that only 4% of 15.000 ads received more than 2 seconds of attention from the 300 participants (Hobbs, 2016). This while Volovich, (2020) described that the average click-through rate (CTR) of a search ad is 1.91% and the average CTR of a display ad is just 0.35%. This implies that, in the case of the display ad, 1.000 impressions are needed to receive around 3 to 4 clicks. This is mainly caused because 76% of marketers fail to use behavioural data for online ad targeting (Heine & Heine, 2019). Therefore, it is not surprising companies still struggle with interpreting data to ensure improved targeting (Liu & Mattila, 2017).

Thus, whenever users browse the internet, they are exposed to various advertisements that are not relevant. Therefore, it is not surprising they look for adblockers and other means (Mathews, 2019). Using adblockers, however, is not completely safe, in particular, such blockers need control over the content and code in the web browser to block online advertisements, making them vulnerable to hackers' exploits (Sebastian, 2019; Mathews, 2019).

A less used and researched means to overcome the current problems of online advertising and privacy risks are so-called user-centralized advertising solutions. According to several studies, this

could be the panacea to the worries of internet users in the online advertising ecosystem (Parssinen et al., 2018; Dutta et al., 2020; Adıgüzel, 2021; Jain et al., 2021). These consumer-centric advertising solutions tend to use blockchain technology to provide safe storage of data and transactions (Rosenberger, 2018; Jain et al., 2021). The data is stored in a chain of different blocks (the blockchain) and is not controlled by one single authority, which makes it difficult to hack. In the context of consumer-centric advertising solutions, blockchain technology is used in different ways, and it offers several advantages (Parssinen et al., 2018; BitClave, 2022; Brave, 2022; IBM, 2022).

First, this solution gives internet users the possibility to be rewarded with digital tokens for sharing their personal information with advertisers. Blockchain technology provides safe and direct transactions of digital tokens between users and advertisers. These digital tokens can be used to buy gift cards which can be used in their favourite online store. Second, internet users can choose whether they want to see online ads while browsing, or not, as well they can set the ad frequency. When they choose to see the ads, they are rewarded with online tokens. This practice is expected to increase ad efficiency (Parssinen et al., 2018). Besides the advantages of consumer-centric advertising, there are also several adoption barriers. According to Parssinen et al. (2018), a broad-scale adaptation requires users to change their behaviour and adopt a specific consumer-centric advertising solution, and similarly to other tech adoptions may prove a challenge. For example, BitClave provides a search engine platform, BASE based on opt-in principles, yet research has shown that installing and using the BitClave platform BASE tends to work as an adoption barrier (Rezaee et al., 2021).

This adoption barrier also applies to another consumer-centric advertising solution: the Brave web browser (Parssinen et al., 2018). The Brave web browser is a consumer-centric advertising solution thereby deploying Basic Attention Tokens (BAT) to reward users (BAT, 2022). BAT transactions are stored and based on Ethereum, which is a version of blockchain technology. However, users have to adopt the Brave web browser as their browser which may be challenging given the presence of established names such as Google Chrome and Microsoft Edge. In addition, internet users are expected to hold back to use consumer-centric advertising solutions, that use blockchain technology, because they may not be familiar with or fail to understand blockchain technology and digital tokens, which likely decreases the level of trust in this type of solution (Parssinen et al., 2018; PwC, 2019). However, more research is needed related to these adoption barriers because previous research has not systematically investigated whether such adoption barriers exist (Parssinen et al., 2018).

Therefore, this study aims to investigate to what extent internet users intend to use consumer-centric advertising web browsers. Considered a potential disruptor of the online advertising ecosystem, to date, research on applications that make use of blockchain technology in marketing is scarce and does not elaborate sufficient insights into the organization and (possible) workings of consumer-centric advertising solutions and the blockchain marketing integration more specifically (Parssinen et al., 2018; Dutta et al., 2020; Adıgüzel, 2021; Jain et al., 2021). In addition, such insights can also

support sketching a future frame for the online advertising landscape facilitating organizations to adapt their business model to this new landscape and effectively use consumer-centric advertising solutions. For this purpose, this study focuses on the Brave web browser (2022) as a case study which is indicative of its accomplishment of the type of change proposed here. Brave aims to provide users with an alternative solution for web browsers like Google Chrome or Internet Explorer.

This is done by investigating the interaction between the constructs of performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), perceived risk (PR), perceived security (PS) and perceived trust (PT). Performance expectancy, effort expectancy, social influence and hedonic motivation are constructs derived from the extended Unified Theory of Acceptance and Use of Technology (UTAUT 2). The UTAUT 2 is relevant for this study because it is specially designed to explain the behavioural intention of users related to the adoption of IT. In addition, the model has a high explanatory power compared to other models in the field of IT – adoption (Venkatesh et al., 2012). However, the UTAUT 2 receives criticism because it cannot be applied to specific contexts. This study aims to overcome this criticism by providing a UTAUT 2-based model with relevant constructs and interactions between the constructs that can be applied to investigate behavioural intention related to the blockchain marketing application. The constructs of habit, price value and facilitating conditions are not included in this study. This is while perceived trust, perceived risk and perceived security are added in the study. Hence, the following research questions are proposed:

RQ: To what extent do Dutch internet users' have the intention to use the Brave web browser?

RQ1: To what extent do performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), perceived risk (PR), perceived security (PS) and perceived trust (PT) influence the Dutch internet users' intention to use the Brave web browser?

RQ2: To what extent do performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM), perceived risk (PR), perceived security (PS) and perceived trust (PT) interact in influencing the Dutch internet users' intention to use the Brave web browser?

The structure of the remainder of this thesis is as follows: first, the different constructs and hypotheses are discussed in the theoretical framework. Then, the methods, such as the online survey, will be discussed in the method section. Thereafter, the hypotheses will be tested in the results section and discussed in the discussion section. Final, the conclusion of this thesis is described.

2. Theoretical framework

This chapter discusses the body of literature relating to the different constructs relevant to develop the empirical framework for this study. This is followed by drawing out the relevant constructs associated with the Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2012). The constructs of perceived trust, perceived security and perceived risk are added to the research. Therefore, the following constructs will be discussed: behavioural intention, performance expectancy, effort expectancy, social influence, hedonic motivation, perceived trust, perceived security and perceived risk. Lastly, multiple substantiated hypotheses are defined and the research model is presented.

2.1 Extended Unified Theory of Acceptance and Use of Technology (UTAUT 2)

User acceptance of new technology is one of the most mature research areas in information systems literature because research in this area has resulted in several theoretical models (Hu et al., 1999). The Unified Theory of Acceptance and Use of Technology (UTAUT) is based on eight different technology adoption models to create a unified view of technology adoption (Venkatesh et al., 2003). This supports researchers in their wide choice of models to assess technology adoption. Since the introduction of UTAUT, many researchers have used and applied UTAUT in different research fields such as blockchain (Wamba & Queiroz, 2019), acceptance of online ads (Salameh et al., 2016), mobile health (Hoque & Sorwar, 2017), mobile learning (Chao, 2019) and artificial intelligence (Andrews et al., 2021). Unless the UTAUT is commonly used in different research fields to predict the acceptance of technologies and systems, doubts exist over the capability of UTAUT to explain individual technology acceptance (Venkatesh et al., 2012; Chao, 2019). In addition, the UTAUT was designed to explain adoption in an organizational context. Therefore, Venkatesh et al. (2012) developed the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) as an extension of the UTAUT to pay particular attention to the context of an individual. The UTAUT 2 describes performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit as predictors of behavioural intention. The constructs of age, gender and experience are moderators in the UTAUT 2 model Venkatesh et al. (2012) described.

The UTAUT 2 is relevant for this study because it pays particular attention to the context of an individual (Venkatesh, 2012). This makes the extended UTAUT more suitable to be used for product or service-oriented research, like consumer-centric advertising solutions (Venkatesh, 2012; Tamilmani et al., 2021). Additionally, the UTAUT 2 includes factors relevant to a user-centric approach that influences the behavioural intention to use new technology (Venkatesh, 2012; Dwivedi et al., 2017). Due to the different constructs in the UTAUT 2, it delivers the highest explanatory power of all technology adoption models and is therefore used in this study (Venkatesh, 2012). However, UTAUT 2 receives criticism because the model does not apply to specific contexts due to the multitude of

constructs and moderators (Weber, 2012; Venkatesh et al., 2016; Tamilmani et al., 2021). Unless the ability of UTAUT 2 to explain 74% of the variance in behavioural intention, not all constructs and moderators are relevant in specific contexts (Venkatesh et al., 2012).

Therefore, researchers incorporated new constructs to the UTAUT 2 and removed other constructs based on the context of their study to explain behavioural intention. For example, Khalilzadeh et al. (2017) included self-efficacy, risk, trust, security and attitude to the UTAUT framework, while Lallmahomed et al. (2013) excluded the construct habit in their research and Kabra et al. (2017) included personal innovation and trust into their research framework.

In the context of this research, the constructs of habit, price value and facilitating conditions are not part of this research. Previous research explained people are not able to develop habitual use when they never used the technology or system (Oliveira et al., 2016; Ramantoko et al., 2016).

Price value and facilitating conditions are considered as not relevant because no costs are incurred when using the technology and it is expected respondents do not need specific facilitating conditions while using a web browser.

Since the Brave web browser aims to improve and restore the level of trust in internet users' experience while browsing and current debates about online privacy and security, perceived trust, perceived security and perceived risk are expected to be important predictors of behavioural intention in this research.

In addition, current IT adoption literature is limited in providing models that explain behavioural intention based on the constructs like perceived security, perceived trust and perceived risks in an online environment (Alqahtani & Braun, 2021). This is while issues like the privacy and security of online usage behaviour are becoming increasingly important topics in society (Hongwei & Peiji, 2011; Bleier & Eisenbeiss, 2015; Leong et al., 2020; Business Insider, 2021). Thus, developing a model that explains the adoption process in the current online environment is essential. Therefore, the constructs of perceived trust, perceived risk and perceived security will be incorporated into this study. To explore and explain behavioural intention, the next section considers performance expectancy, effort expectancy, social influence, hedonic motivation, perceived trust, perceived security and perceived risk.

2.2 Behavioural intention

Explaining human behaviour is a difficult task because it can be approached from many levels. This also applies to behavioural intention. Fishbein and Ajzen, (1975) described behavioural intention as the readiness to perform a given behaviour which is a result of a person’s attitude towards the behaviour and the perceived expectations of the social environment. Behavioural intention is also defined as a result of three types of considerations: beliefs about the consequences of the behaviour, beliefs about the expectations of other people and the perception of the ability to perform a given behaviour (Ajzen, 1991). The higher the behavioural intention, the greater the probability people will

perform a certain behaviour. Several, studies aimed to explain the behavioural intention of people towards technology use, such as the Technology Acceptance Model (TAM) (Davis, 1989), Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Theory of Planned Behaviour (TPB) (Fishbein & Ajzen, 1980), Motivational Model (Guay & Vallerand, 1996) and the Social Cognitive Theory (Bandura, 1986).

2.3 Performance expectancy

Performance expectancy is a commonly used construct in technology innovation and adoption research (Venkatesh et al., 2003; Hewavitharana et al., 2021). Performance expectancy is described as the construct with the strongest impact on behavioural intention in organizational contexts (Venkatesh et al., 2003). Many studies in the field of IT adoption literature confirmed this finding (Gupta et al., 2008; Eckhardt et al., 2009; Al-Shafi & Weerakkody 2009; Venkatesh et al., 2012; Salameh et al., 2016; Lallmahomed et al., 2017; Khalilzadeh et al., 2017; Dwivedi et al., 2017; Wamba & Queiroz, 2019; Arfi et al., 2021). Performance expectancy indicates to what extent a person believes the use of the new technology would increase his or her job or task performance (Venkatesh et al., 2003). This construct is similar to the perceived usefulness described in the TAM (Davis et al., 1989) and the outcome expectations of the Social Cognitive Theory (Bandura, 1986). The consensus in IT adoption literature is that individuals will be more likely to adopt new technology if they believe the technology will improve the performance of their tasks (Verkijika, 2018).

Although many studies described the influence of performance expectancy on behavioural intention, a limited number of studies described the influence of performance expectancy on behavioural intention as insignificant (Zhang et al, 2012; Chong, 2013; Faqih and Jaradat, 2015; Liébana-Cabanillas et al., 2017; Verkijika, 2018). These studies apply to user-centric contexts such as the adoption of e-commerce applications, m-commerce applications and social networks applications which might explain these contradictory results. However, in the field of online banking adoption, it was found that several studies with a user-centric contextual approach do describe performance expectancy as a significant predictor of behavioural intention (Escobar-Rodríguez & Carvajal-Trujillo, 2014; Workman 2014; Martins et al., 2014; Merhi et al., 2019; Al-Saedi et al., 2020). These studies investigated the intention to use improved online banking systems that increased privacy and security.

In the context of this research, it is expected that performance expectancy will have a positive influence on behavioural intention because the Brave web browser aims to improve the performance of web browsing by attaching importance to privacy, browsing speed and blocking annoying ads (Brave, 2022). Thus, the following hypothesis is proposed:

H1: Performance expectancy has a positive influence on behavioural intention.

2.4 Effort expectancy

Effort expectancy is the degree of ease associated with the use of new technology (Venkatesh et al., 2003). Several studies emphasized the importance of effort expectancy (Rogers, 1983; Davis et al., 1989; Thompson, 1991). Effort expectancy is derived from the construct of perceived ease of use in the TAM (Davis et al., 1989). This is the degree to which a person believes that using a particular system would be free of effort. Effort expectancy is one of the main predictors of behavioural intention and therefore many other studies described the influence of effort expectancy on behavioural intention (Dulle & Minishi-Majanja, 2011; Oktal, 2013; Tosuntaş et al., 2015; Kabra et al., 2017; Chen & Hwang, 2019).

However, other studies in the field of IT adoption described that effort expectancy becomes insignificant in studies where respondents do not have enough knowledge about the technology because the technology is relatively new. This has been found in studies about emerging services, location-based services (Zhou, 2012), electronic document management systems (Afonso et al., 2012; Akinnuwesi et al., 2022), the adoption of an educational forum, used for mobile and distance learning (Isaias et al., 2017), social network sites (Herero et al., 2017) and the adoption of e-commerce applications (Verkijika, 2018). Respondents are not able to make a good estimate of the expected effort the technology will demand. However, in this research, it is expected respondents can make a reliable estimate of their effort expectancy since the navigation of the Brave web browser aligns with other web browsers.

Other studies described the indirect influence of effort expectancy on behavioural intention. Through its positive influence on performance expectancy (Oliveira et al., 2016; Alalwan et al., 2017; Herero et al., 2017; Verkijika, 2018). This aligns with the findings of the Technology Acceptance Model (TAM) which describes that the perceived ease of use has a direct effect on the perceived usefulness (Davis et al,. 1989). The navigation and design of the Brave web browser are similar to other web browsers and therefore it is expected internet users will believe the use of the Brave web browser is relatively free of effort. This will positively influence performance expectancy because it is believed a web browser performs well when the browser is easy to use. Based on this information it is expected that effort expectancy has a positive influence on performance expectancy and behavioural intention. Therefore, the following hypotheses are proposed:

H2a: Effort expectancy has a positive influence on behavioural intention.

H2b: Effort expectancy has a positive influence on performance expectancy.

2.5 Social influence

The notion that the behaviour of an individual is influenced by how they believe others will view them as a result of having used the technology is social influence (Venkatesh, 2003). In the case of this research, this indicates the influence of others on participants which may affect the behavioural

intention towards the Brave web browser. Ajzen, (1991) described social influence as the subjective norm which is the perception of a person that people who are important to the person believe he or she should or should not perform the behaviour. While Thompson et al. (1991) described that social influence depends on the social norms the person is dealing with. The social norms depend on the different cultures or social situations the person is part of.

In different research fields, several studies identified social influence as a significant factor in determining behavioural intention (Qin et al., 2011). Dwivedi et al. (2017) confirmed the relationship between social influence and behavioural intention and described attitude as an important moderating variable. However, Wamba & Queiroz, (2019) confirmed social influence not only as a predictor of behavioural intention but also as a predictor of performance expectancy, effort expectancy and facilitating conditions in the context of blockchain adoption. In contrast, Erjavec & Manfreda (2022) argued that social influence has no significant influence on behavioural intention. They proposed to reconsider the construct of social influence and use the complementary factor of herd behaviour.

However, Eckhardt et al. (2009), stated that the effect of social influence on technology adoption differs significantly in various contexts. Workman (2014) confirmed these findings and described that the relationship between behavioural intention and social influence depends on the context, especially on the reason why people use the technology in the first place. This aligns with the research of Venkatesh, (2003) who argued that in mandatory settings and earlier stages of technology adoption, the perceived social influence will have a stronger effect. People are not able to choose and are unfamiliar with the technology, which could cause discomfort. The feeling of discomfort makes people more impressionable while they search for validation which they possibly can find in the opinions of others.

However, currently, online privacy and the frequency of online ads are important topics in society that have been points of discussion (Hongwei & Peiji, 2011; Business Insider, 2021; Heiligenstein, 2022). Therefore, it is expected that social influence affects behavioural intention. Unless these topics of debate, current literature is limited in explaining the effect of social influence on the level of initially perceived trust during the adoption process of a new online system, like the Brave web browser (Wei et al., 2019; Oldeweme et al., 2021). Several studies describe the positive significant influence of social influence on perceived trust (Beyari & Abareshi, 2018; Wei et al., 2019; Abbas Naqvi et al., 2020; Wang et al., 2022), however, in the context of these studies, users already had experience using the technology. For example, the user intent of the application Instagram (Abbas Naqvi et al., 2020), online shopping websites (Wang et al., 2022) and social commerce (Beyari & Abareshi, 2018). The effect of social influence increases in situations where the user has no previous knowledge about a certain technology (or online system) (Li et al., 2008; Wei et al., 2019; Khalilzadeh et al., 2017; Oldeweme et al., 2021). Therefore, the following hypotheses are proposed:

H3a: Social influence has a positive influence on behavioural intention.

H3b: Social influence has a positive influence on perceived trust.

2.6 Hedonic motivation

Hedonic motivation is the pleasure derived from using technology (Brown & Venkatesh 2005). Similar to hedonic motivation, Chang et al. (2017) described perceived enjoyment as an important factor in technology adoption. According to Venkatesh et al. (2012), there is a significant influence of hedonic motivation on behavioural intention and it is the most important predictor of behavioural intention in non-organizational contexts. The higher the perceived hedonic motivation, the higher the intention to use technologies or services (Venkatesh et al., 2012; Chopdar et al., 2018). Several other studies in the field of IT adoption confirmed these findings. Nikolopoulou et al. (2021) described that there is a positive effect of hedonic motivation on teachers' behavioural intention to use mobile internet in their lessons. While Dwivedi et al. (2018) described hedonic motivation as an important predictor of Mobile Social Network Games adoption. This indicates that when users derive pleasure from using a new technology they are more likely to use this technology.

Based on the TAM, several studies argued that perceived enjoyment has a positive influence on perceived ease of use and perceived usefulness (Sánchez-Prieto et al., 2016; Chang et al., 2017; Tsai et al., 2018). In the context of UTAUT 2, several studies described the influence of effort expectancy and performance expectancy on hedonic motivation (Davis et al., 1992; Pantano & di Pietro, 2012; Maillet et al., 2015; Holdack et al., 2022). This implies that the level of hedonic motivation will increase when people expect less effort and high performance. This while limited studies described the effect of hedonic motivation on performance expectancy and effort expectancy (Chao, 2019).

However, since respondents are not able to use the Brave web browser in this research, it is expected that people develop a level of hedonic motivation based on the expected performance and effort. This is because, according to Pantano & di Pietro (2012) and Holdack et al. (2022), people expect new technologies to be more convenient and reduce information searching efforts which increases the hedonic value. As a result, these technologies make the impression of being more applicable as well as informative. Therefore, the hedonic value will increase when people perceive the Brave web browser as easy to use and perceive a high performance of the Brave web browser. Since Brave aims to provide a browsing experience with less annoying ads it is expected that internet users will experience the use of the web browser as pleasurable.

H4a: Hedonic motivation has a positive influence on behavioural intention.

H4b: Performance expectancy has a positive influence on hedonic motivation.

H4c: Effort expectancy has a positive influence on hedonic motivation.

2.7 Perceived trust

Several studies described the positive influence of perceived trust on behavioural intention (Erikkson et al., 2005; Chao, 2019; Merhi et al., 2019; Sharma & Sharma, 2019). For example, Alalwan et al. (2015) described perceived trust as an important predictor of the adoption of internet banking. While Al-Saedi et al. (2020) described perceived trust as a predictor of the adoption of m-payments. Trust is a complex construct that can be defined from different viewpoints (Mayer et al., 1995). Therefore, Blomqvist, (1997) described that no universal definition of trust is possible because the definition of trust always depends on the situation. However, some researchers described a universal definition of trust. For example, Mayer et al. (1995) described trust as the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party. While Arpaci, (2016) defined trust as the perceptions about the reliability and trustworthiness of the system.

In this research perceived trust is described as the willingness of an internet user to be vulnerable to the actions of the Brave web browser based on the expectation that the Brave web browser will protect the personal data of internet users, irrespective of the ability to monitor or control the actions of the Brave web browser. Trust is seen as an important construct in this research because the Brave web browser aims to be a web browser that can be trusted by protecting internet users from ads, trackers and other malicious content online (Brave, 2022).

Several studies in the IT adoption literature described perceived trust as an important predictor of behavioural intention (Shin, 2009; Chopdar et al., 2018; Merhi et al., 2019; Chao, 2019; Al-Saedi et al., 2020). These studies also described perceived risk and perceived security as important constructs related to perceived trust. However, according to Sun et al. (2020) and Alqahtani & Braun, (2021), current UTAUT 2 literature mainly focuses on trust in the context of mobile banking services, smart mobile acceptance, e-prescribing technology acceptance (related to e-health) and e-governance technology. However, current literature is limited in examining trust related to personal data based on online usage behaviour. This is while online trust becomes increasingly important due to online trust debates in society.

Important mediating variables of trust are perceived security and perceived risk (Khalilzadeh et al., 2017; Sun et al., 2020). Therefore, it is important to investigate how perceived risk, perceived security and perceived trust interact with each other in the context of this research.

H5: Perceived trust has a positive influence on behavioural intention.

2.8 Perceived security

Several UTAUT-related studies included perceived security in their study and confirmed the positive influence of perceived security on behavioural intention (Salisbury et al., 2001; Escobar-Rodríguez & Carvajal-Trujillo, 2014; Maqableh et al., 2021). Studies reflected on the construct of perceived security as one of the most critical IT adoption barriers due to the possibility of data leakage or theft by hackers (Ghosh & Swaminatha, 2001; Merhi et al., 2019). Since data breaches like the Cambridge Analytica scandal internet users value privacy protection. It is expected when internet users perceive the Brave web browser as secure, they are more likely to use the web browser.

According to Sailsbury et al. (2001) perceived security is the extent to which one believes that the World Wide Web is secure for transmitting sensitive information. While Maqableh et al. (2021) described perceived security as the threat of discernible loss or harm to personal data that is caused by an exploited weakness in system design, implementation, or procedures. Shin (2009) described perceived security as "the degree to which a customer believes that using a particular procedure will be secure" (p. 1346). Perceived security is seen as a mediating variable of the effect between perceived trust and behavioural intention (Sun et al., 2020; Alqahtani & Braun, 2021). This implies that there is no effect possible between perceived trust and behavioural intention when there is no level of perceived security present. As described by Mayer et al. (1995), trust is the willingness of a party to be vulnerable to the actions of another party. The willingness to be vulnerable depends on how secure people feel (Mayer et al., 1995; Sun et al., 2020; Alqahtani & Braun, 2021). Therefore, perceived security is seen as mediator variable. In this case of mediation, the presence of the mediator's perceived risk is a must. However, current literature is limited in examining the mediating effect of perceived security between perceived trust and behavioural intention (Basbeth & Sumapraja, 2021). Thus, the following hypothesis is proposed:

H5a: Perceived security will mediate the effect between perceived trust and behavioural intention.

2.9 Perceived risk

Using the internet is not without risks. Internet users worry often about risks such as privacy issues, errors, losing passwords or the security of their software. While Venkatesh et al. (2012) did not describe perceived risk as the main predictor of behavioural intention, several other studies indicated that perceived risk negatively influences behavioural intention (Martins et al., 2014; Alalwan et al., 2017). Featherman and Pavlou, (2003) defined perceived risk as the likelihood of a customer suffering a loss when using new technology. He et al. (2022) described perceived risk as perceived safety, which is the level of risk experienced by users. A low level of perceived risk leads to feeling safe and relaxed (Zhang et al., 2011; He et al., 2022).

Most studies describe that users who perceive a higher risk while using the technology, perceive the technology as less useful and less easy to use (Heijden et al., 2003). This implies that perceived risk has a moderating influence on performance expectancy and effort expectancy. However, Fagih, (2013) revealed that perceived risk does not influence the perceived ease of use and perceived usefulness.

In the current academic literature related to the adoption of IT systems, researchers argue whether perceived risk is a mediating or moderating variable of the effect between perceived trust and behavioural intention (Im et al., 2008).

Limited studies described perceived risk as a moderating effect on the effect between perceived trust and behavioural intention (Shaikh et al., 2018). This implies when people perceive a higher level of risk, people are less likely to develop trust in a technology which lowers the intention of adopting new technology (Featherman & Pavlou, 2003; Abrahão et al., 2016).

However, according to Siegrist et al. (2005), trust involves risk. This implies that with no risk people do not need trust. Therefore, this study considers perceived risk as a mediating variable because trust and risk cannot be without each other. This aligns with several studies that described perceived risk as a mediator between the influence of perceived trust on behavioural intention (Mayer et al., 1995; Lee & Song, 2013; Arfi et al., 2021). Thus, the following hypothesis is proposed:

H5b: Perceived risk will mediate the effect between perceived trust and behavioural intention.

2.10 Moderating variables

The UTAUT 2 describes age, gender and experience as moderating variables. This implies that the effect between the constructs described in the UTAUT 2 and behavioural intention might be different between men and women, when age increases or when someone already has experience with using the technology. Men are, for example, relatively more task-oriented and therefore have different performance expectations compared to women (Hall & Mansfield 1975; Minton & Schneider 1980). Other studies have shown that older people are more likely to adopt new technologies when they perceive the technology as useful and beneficial compared to relatively younger people (Lian & Yen, 2014; Hoque & Sowar, 2017).

However, several studies described, that the moderating variables: age, gender and experience, have no significance at all the times that the technology is still very new and not commonly used (Al-Qeisi et al., 2014; Akinnuwesi et al., 2022). However, their findings could be explained due to the specific context of their research since many studies in the IT adoption literature describe age, gender and experience as significant moderating variables.

Other studies argued there is no difference between men and women when adopting a relatively "risk-free" technology (Riquelme & Rios, 2010; Liébana-Cabanillas et al., 2014; Farooq et al., 2022). This is while the consensus in IT adoption research describes the moderating influence of age, gender and experience. It seems that men are less risk-averse in situations that could affect others. For example, female CEOs are more risk-averse compared to male CEOs when it comes to making decisions about which technology the organization has to adopt and which the whole organization must use (Farooq et al., 2022).

The adoption of the Brave web browser is expected to be relative "risk-free" and therefore gender is expected not to have a significant moderating influence on the different constructs. However, age is expected as a significant moderating variable in this research. Older people are less used to innovations, experience more difficulties with processing tasks and perceive the effort as more complex (Plude & Hoyer, 1985; Venkatesh et al., 2012). Therefore, it is expected older people are less likely to adopt a new web browser. Baruk en Iwanicka, (2016) described that men tend to be more critical and therefore perceive innovations as less credible than women. The moderating construct experience will not be part of this research. Only respondents with no experience using the Brave web browser will be able to take part in this research. Therefore, the construct experience is expected not to be a significant moderating construct. Thus, the following hypothesis is proposed:

H6: Age will moderate the effects of PE, EE, SI, HM, PT, PS, and PR on behavioural intention.

2.11 Hypotheses

This study focuses on the effect of different constructs on the behavioural intention. Therefore, several hypotheses have been formulated and which are presented in Table 1.

Table 1 *Overview of all hypotheses*

No	Hypothesis
H1	Performance expectancy has a positive influence on behavioural intention
H2a	Effort expectancy has a positive influence on behavioural intention.
H2b	Effort expectancy has a positive influence on performance expectancy.
H3a	Social influence has a positive influence on behavioural intention
H3b	Social influence has a positive influence on perceived trust
H4a	Hedonic motivation has a positive influence on behavioural intention
H4b	Performance expectancy has a positive influence on hedonic motivation
H4c	Effort expectancy has a positive influence on hedonic motivation
H5	Perceived trust has a positive influence on behavioural intention.
H5a	Perceived security will mediate the effect between perceived trust and behavioural intention.
H5b	Perceived risk will mediate the effect between perceived trust and behavioural intention.
H6	Age will moderate the effects of PE, EE, SI, HM, PT, PS, and PR on behavioural intention.

2.12 Research model

Based on the information of the theoretical framework and the formulated hypotheses, a conceptual model of this research was developed. This model is visualized in figure 1.

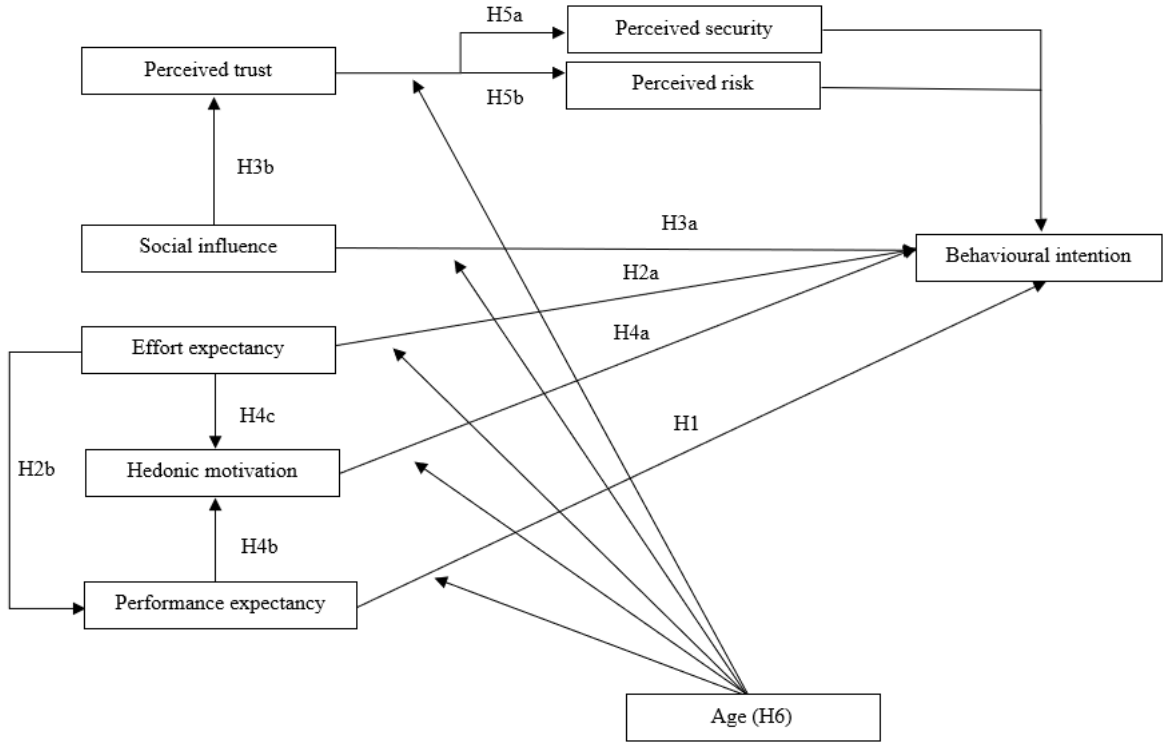


Figure 1 *Research model*

3. Methods

This section describes how this study was designed to answer the research question, how participants were approached and obtained, the research procedure and the measurement of this study.

3.1 Design

For this study, an online survey was conducted to answer the research question. This study is a cross-sectional study about the effect of performance expectancy, effort expectancy, social influence, hedonic motivation, perceived trust, perceived risk and perceived security on behavioural intention. Cross-sectional studies provide data from a large pool of people but only study a single moment in time (Boeije, 2009; Razina, 2021). Therefore, they cannot be used to analyze long-term trends. In this study, an online survey was used because surveys can describe the characteristics of a large population and people are able to easily participate in this study (Boeije, 2009; Jackson, 2020). In addition, participants can participate anonymously in a survey which allows them to be as honest as possible. This will provide more accurate data. For example, face-to-face, participants may be less likely to indicate that they do not understand using the Brave web browser because they are ashamed of it. A limitation of an online survey is that it is not possible to see the emotions of the participants which could provide more in-depth information (Boeije, 2009; Razina, 2021). However, in this study, it was important to make more accurate conclusions and decisions about a large population. This research aims to uncover the behavioural intention of Dutch internet users towards the Brave web browser. Since Dutch internet users are a large group of people, an online survey was seen as sufficient in this research.

3.2 Participants

The participants are Dutch internet users older than 18 years. Internet users are people who have ever used the internet. Participants had to be above 18 years because people from 17 years or younger are allowed to use and receive the Basic Attention Tokens (BAT, 2022). The potential participants were approached through convenience sampling and snowball sampling. LinkedIn, Facebook, Instagram, WhatsApp, E-mail and face-to-face communication were used to approach potential participants. First, participants were recruited for a pre-test of the online survey. The pre-test lasted from the 11th of July 2022 till the 15th of July 2022. In total, 12 people took part in the pre-test. Overall, the online survey was relatively clear to the participants of the pre-test. However, the information about the Brave web browser and the questions about social influence needed some adjustments to improve clarity. After the pre-test was finished, participants of the pre-test were excluded from participating in the online survey. The online survey lasted from the 18th of July 2022 till the 14th of August 2022. To increase the validity of the research, the aim was to get a minimum of 300 participants. In total, 318 respondents were recruited to participate in this research. However, 95 participants did not finish the online survey. Therefore, the total number of respondents in this study is

224. One participant did not agree with the active consent, which reduced the number of participants in this study to 223 (N=223). In total, 62% of the participants were male, 37% were female and 1% of the participants preferred to not reveal their gender. In this study 36% of the participants were between 18 and 28 years old, 28% of the participants were between 29 and 38 years old, 17% of the participants were between 39 and 48 years old, 12% were between 49 and 58 years old and 9% were between 59 and 68 years old.

3.3 Procedure

The online survey tool Qualtrics was used to distribute the survey to a large set of Dutch internet users above 18 years old through snowball sampling (Boeije, 2009). Participants were able to anonymously answer the questions in the survey. The statistical program SPSS was used to test the hypotheses. Qualtrics will generate the answers in an SPSS data file.

All participants received an anonymous link to the online experiments. After agreeing with the informed consent, the participants had to answer two questions about their age and gender. The informed consent is visible in appendix B. Thereafter, participants were asked about their experience and familiarity with the organization Brave. For some additional analysis, participants were asked about their general level of trust related to blockchain technology and their experience with adblockers. Hereafter, participants were given some basic information about Brave and Brave Ads in a short video and a short text to inform the participants about the context of the research. This information is visible in Appendix C. This was based on the information Brave provides on its website. As a result, the information is comparable to a situation when the participants themselves would search for information on the internet about Brave.

While completing the survey, respondents are not encouraged to download the Brave web browser. Since this was seen as an extra barrier to completing the survey. Since there were at least 300 respondents needed in this research, it was expected that mandatory downloading of the Brave web browser will make it less likely for people complete the survey. In addition, Venkatesh et al. (2012) described that technology adoption will be different in a mandatory and voluntary context. Requiring respondents to download the Brave web browser, will create a mandatory context that differs from reality where people are free to choose whether they want to use the Brave web browser. Each participant answered three to six questions about performance expectancy, effort expectancy, social influence, hedonic motivation, perceived trust, perceived risk, perceived security and behavioural intention. All questions are visualized in appendix D. In total, the online survey contained 34 questions. To analyse the data, a multiple regression analysis was applied to measure the effect of multiple variables on dependent variables, such as behavioural intention, perceived security, performance expectancy and effort expectancy. For analysing mediating relationships, the Hayes process Macro v4.0 was applied in SPSS.

3.4 Research context: Brave

The Brave web browser has served as a case study as it is indicative of its accomplishment of the type of change proposed in this study. Brave is a web browser, like Google Chrome or Internet Explorer, however, according to its developers, the existing web browsers are 'a sea of data-sucking ads' that slow websites down and collect a lot of personal data (Brave, 2022). Therefore, Brave is on a mission to protect privacy by securing private browsing for all internet users. The diversity of middlemen and the lack of value to the publisher and user make the current online advertising ecosystem untenable. Brave aims to improve the efficiency and privacy of the online advertising ecosystem by developing the Brave web browser and the Basic Attention Token (BAT) as a unit of exchange (BAT, 2022). Brave connects advertisers, publishers, and users, creating a new marketplace. Advertisers directly pay ad space to publishers and reward users for their attention with BAT, users can reward publishers with BAT, for example, when they value the content publishers share. Brave earns 30% of the BAT reward advertisers sent to Brave users. The other 70% can be used to buy gift cards or reward publishers. In return, Brave users can decide if they want to see ads or choose to see no ads at all. BAT exchanges are based and stored on Ethereum technology, an open-source, blockchain-based distributed computing platform.

However, the Brave web browser has several adoption barriers (Parssinen et al., 2018). First, Brave users have to adopt a new unknown browser, which may be an obstacle to adoption. This is similar to new products, services or other innovations. The second adoption barrier in the Brave model is the introduction of BAT as a currency for advertising. Users may not be used to acquiring tokens which may become an adoption obstacle.

3.5 Measurement

In this study, a five-point Likert scale was used (MacKenzie & Lutz. 1989; Al-Lozi et al., 2014). In this Likert scale, one stands for strongly disagree and five stands for strongly agree. This scale was used to measure the different constructs: behavioural intention, performance expectancy, effort expectancy, hedonic motivation, perceived risk, perceived security, social influence and perceived trust. All scales were adopted from prior research. To measure performance – and effort expectancy, it was intended to use the four-item scales described by Venkatesh et al. (2012).

To measure social influence, hedonic motivation and behavioural intention the three-item scales described by Venkatesh et al. (2012) were used. To adjust the scales of these constructs to the context of this research several statements were added to the scales of social influence and behavioural intention described by Venkatesh et al. (2012). To the constructs of social influence the following statements were added: people who are important to me think that my browsing behaviour is risky, people who influence my behaviour think that I should attach more importance to my online security and people who are important to me think that the browser I currently use is not trustworthy. These statements were added to justify if there was a difference between social influence related to the Brave

web browser and social influence related to privacy, security and trust in general. As described by Workman (2014), the level of social influence is context-dependent. Therefore, it was considered important to adjust the social influence scale to the context of this research. The same applies to the scale of behavioural intention since it is believed the current statements are too general and do not apply to the context of this research. Therefore, the following statements were added: instead of the browser I currently use I plan to use the Brave web browser as my main browser. This statement was added to measure the willingness of the respondents to use the Brave web browser.

The scale from perceived trust was adopted from the research from the four-item scale described by Maqableh et al. (2021), who validated a scale for the measurement of trust. The perceived risk scale is adopted from the three-item scale described by Featherman & Pavlou, (2003) and the perceived security scale from the six-item scale described by Salisbury et al. (2001). To the three-item scale of perceived risk, the following questions were added: I think using the Brave web browser puts my privacy at risk. To improve the reliability of this survey some questions were asked in reverse.

The data of the respondents was generated via Qualtrics and analysed via SPSS. In SPSS descriptive statistics, measurements for reliability, validity and significance, were used to analyse the results of the survey and to test the hypotheses. To check the validity of the questions in the survey a factor analysis was developed. The Kaiser-Meyer-Olkin (KMO) of this factor analysis gave a result of .878. This confirmed that the data is suited for further analysis. The factor analysis gave insight into the correlations between the factors and the measurement items. The results of the factor analysis are presented below in Table 2.

Table 2

Results of the items in the scales from the rotated component matrix in the factor Analysis

Items	1	2	3	4	5	6	7
Using the Brave web browser will increase my changes of achieving things that are important to me	.64						
Using the brave web browser will help me accomplish things more quickly	.80						
Using the Brave web browser will increase my productivity	.85						
Learning how to use the Brave web browser will be easy for me		.88					
The brave web browser will be easy to use		.79					
It will be easy for me to become skillful at using the Brave web browser		.83					
People who influence my behaviour might encourage me to use the Brave web browser			.74				
People who influence my behaviour might encourage me to use the brave web browser because they believe the brave web browser is not trustworhty			.78				
People who are important to me might encourage me to use the Brave web browser because they think that my browsing behaviour is risky			.63				
People who influence my behaviour might encourage me to use the Brave web browser because they believe I should attach more importance to my online security			.70				
Using the Brave web browser will be fun				.78			
Using the Brave web browser will be enjoyable				.69			
Using the Brave web browser will be entertaining				.81			
Using the Brave web browser will subject my personal information to potential fraud.					.74		
Using the Brave web browser will lead me to a loss of privacy because my personal information will be used without my knowledge					.83		
Brave employees will take control of my personal data if I use the Brave web browser					.76		
I think using the Brave web browser will put my privacy at risk					.77		
I will feel secure sending sensitive information using the Brave web browser						.81	
The Brave web browser will be a secure means through which to send sensitive information						.69	
I will feel totally safe providing sensitive information about myself while using the Brave web browser						.81	
I will have no concerns about giving out sensitive information over the Brave web browser						.75	
I will give out sensitive information over the Brave web browser						.68	
Overall, the Brave web browser will be a safe place to transmit sensitive information						.70	
The Brave web browser will be trustworthy						.60	
Brave will respect and will not abuse my private information and browsing log history						.62	
I will intend using the Brave web browser in the future							.72
I will use the brave web browser in my daily life							.82
I will plan to use the brave web browser frequently							.76
I will plan to use the Brave web browser as my main browser instead of the browser I currently use							.58

In this overview 1 = performance expectancy, 2 = effort expectancy, 3 = social influence, 4 = hedonic motivation, 5 = perceived risk, 6 = perceived security and 7 = behavioural intention. Correlation coefficients with a magnitude of 0.5 or higher can be considered moderately correlated. All statements with a magnitude of less than 0.5 have been removed. This includes PERFORMANCE1 – the Brave web browser will be useful in my daily life, TRUST2 – I will trust the information Brave provides to be true and TRUST3 – the Brave web browser will be fair.

The factor analysis showed that different items from the same scale did not respond to each other. EFFORT2 - the interaction with the Brave web browser will be clear and understandable was excluded because it did not correlate with the EFFORT1, EFFORT2 and EFFORT4 and therefore individually analyzed a construct. TRUST5 – Brave gives me a reason to trust Brave correlated with the construct of behavioural intention and therefore was excluded from the analysis.

The final factor analysis shows seven different constructs. The statements of trust, TRUST1 and TRUST4 correlated with the construct of perceived security. This is not surprising since the constructs of perceived trust and perceived security partially overlap. Therefore, in this research, the construct of perceived trust will be excluded from this research because the items TRUST3, TRUST4 and TRUST5 are not considered as significant and TRUST1 and TRUST4 are added to the construct of perceived security.

To test if the measurement is reliable and consistent in producing comparable results under similar conditions, Chronbach's alpha of each construct was calculated. The construct is considered reliable when the alpha level is above .70. In Table 3 an overview of Cronbach´s Alpha is presented. Table 3 shows that the alpha level of all constructs is above .70. This indicates that all constructs are reliable.

Table 3 *Cronbach´s Alpha*

Constructs	Number of items	Cronbach´s Alpha
Performance expectancy	3	.75
Effort expectancy	3	.81
Social influence	4	.79
Hedonic motivation	3	.74
Perceived risk	4	.83
Perceived security	8	.89
Behaviour intention	4	.86

4. Results

In this section the results of this study are presented. First, the descriptive statistics of the sample are visualized. In the second part, the results of the hypothesis test are described.

4.1 Descriptive statistics

In Table 4, the mean and the standard deviation are presented. It shows that effort expectancy has the lowest mean (2.0) and perceived risk has the highest mean (3.7). It is also noticeable that performance expectancy, social influence, hedonic motivation, perceived security and behavioural intention have a mean of 2.8 or 2.9.

Table 4 *Means and standard deviations for each construct*

Constructs	Number of items	Mean	Standard deviation
Performance expectancy	3	2.9	.77
Effort expectancy	3	2.0	.51
Social influence	4	3.1	.79
Hedonic motivation	3	2.9	.56
Perceived risk	4	3.7	.69
Perceived security	8	2.8	.75
Behavioural intention	4	2.9	.76

The mean and standard deviation of male and female participants by age category for each construct are visualized in Appendix A. Appendix A shows stand-out differences of means between males and females in different age groups of the construct's performance expectancy, effort expectancy, social influence and perceived security. For example, the mean of males, in the age group 49 thru 58 of the construct perceived security, is 3.4 while the female has a mean of 2.8.

4.2 Hypotheses testing

To analyze the main effects of this research a regression analysis and a Hayes process v4.0 analysis has been executed.

4.*2.1. The effect of performance expectancy, effort expectancy, social influence, hedonic motivation, perceived risk, and perceived security on behavioural intention.*

To measure the effect of the variables performance expectancy, effort expectancy, social influence, hedonic motivation, perceived risk and perceived security on behavioural intention a multiple regression analysis was executed. The behavioural intention was regressed as the dependent variable. Combined, the variables of performance expectancy, effort expectancy, social influence,

hedonic motivation, perceived risk and perceived security have a significant effect on behavioural ($F(6,213) = 24.41$, $R2 = .41$ and $p < .001$). The multiple regression analysis showed no significant relation with performance expectancy ($\beta = .09$, $SE = .06$ and $p = .09$) and hedonic motivation ($\beta = .04$, $SE = .08$ and $p = .64$). Further, it was found that effort expectancy ($\beta = .19$, $SE = .01$ and $p = .02$), social influence ($\beta = .227$, $SE = .06$ and $p < .001$) and perceived security ($\beta = .359$, $SE = .06$ and $p < .001$) positively relate to behavioural intention. It was found that the last construct, perceived risk, has a significant negative relation to behavioural intention ($\beta = -.159$, $SE = .06$ and $p = .01$). Based on these results, hypotheses 1 and 4a could not be supported. However, hypotheses 2a and 3a could be supported. In addition, hypothesis 5a and 5b could not be tested because it was decided to delete the construct of perceived trust.

4.2.2 The effect of social influence on perceived security

Since the construct of perceived trust was deleted and several statements did correlate with the construct of perceived security, it was decided to investigate the effect of social influence on perceived security. However, it must be noted that hypothesis 3b is partly supported because the construct of perceived trust is deleted. To measure the effect of perceived risk and social influence on perceived security, a linear regression analysis was executed. Therefore, perceived security was regressed as the dependent variable and social influence as the independent variable. It was found that social influence has a positive significant influence on perceived security ($\beta = .33$, $SE = .06$ and $< .001$).

4.2.3 The effect of effort expectancy on performance expectancy

To test the effect of effort expectancy on performance expectancy a linear regression analysis has been executed. Effort expectancy was regressed as the independent variable and performance expectancy as the dependent variable. It was found that effort expectancy has no significant effect on performance expectancy ($\beta = .12$, $SE = .10$ and $p = .08$). Therefore, hypothesis 2b could not be supported.

4.2.4 The effect of performance expectancy and effort expectancy on hedonic motivation

To measure the effect size of hedonic motivation on performance expectancy and effort expectancy, a linear regression analysis was executed. The results showed that performance expectancy ($\beta = .33$, $SE = .24$ and $p < .001$) and effort expectancy ($\beta = .22$, $SE = .07$ and $p = .002$) had a positive influence on hedonic motivation. Based on the descriptive statistics, it could be confirmed that respondents who experienced higher levels of performance expectancy and lower levels of effort expectancy had higher levels of hedonic motivation. Therefore, it could be concluded that hypotheses 4b and 4c are supported.

4.2.5 Mediating effect of perceived risk

A mediation analysis using Hayes process v4.0 analysis has been executed. This has been done to test the mediating effect between perceived security and behavioural intention by perceived risk. Since the construct of perceived trust was deleted and several statements were added to the construct of perceived security hypotheses 5a and 5b could not be tested. Therefore, it was decided to investigate if perceived risk mediates the effect between perceived security and behavioural intention.

The total effect of this model was $\beta = .55$, S.E. = .06 and $p = < .001$. This implies that perceived risk is a significant mediator of the effect between perceived security and the behavioural intention. It was noted that perceived security was a significant negative predictor of perceived risk ($\beta = -.35$, S.E. = .06 and $p < .001$). Last, the results indicated that perceived risk was a negative significant predictor of behavioural intention ($\beta = -.18$, S.E. = .07 and $p = .008$). Based on these results, a partial mediation model was observed and hypothesis 5b could be partially supported.

Figure 2 *Mediating effect*

4.2.6 Moderating effects of age and gender

Hypothesis 6 described a moderating effect between the six constructs and behavioural intention by age. To test the effect of age, a MANOVA test was conducted to analyse if there is a significant effect of age on the six constructs. The MANOVA analysis found that age has a significant effect on behavioural intention ($F(4,219) = 1.21$, $p = .037$), effort expectancy ($F(4,219) = 3.94$, $p < .001$), social influence ($F(4,219) = 4.06$, $p = .047$), hedonic motivation ($F(4,219) = 4.35$, $p = .002$) and perceived security ($F(4,219) = 6.91$, $p < .001$). As described in the descriptive statistics, this implies that younger people are more likely to have the intention to use the Brave web browser, expect that the Brave web browser is relatively easy to use, are more likely to be influenced by their social environment, expect to perceive more hedonic motivation and perceive the Brave web browser as more secure compared to older age groups in this study.

However, this significant effect does not explain the possible moderating effect between the six constructs on the behavioural intention by age and gender. Therefore, a Hayes process v4.0

analysis has been executed to test the moderating effect between the seven constructs and behavioural intention by age and gender. However, it was found that age and gender do not have a significant moderating effect on the association between the six constructs and behavioural intention. In Table 6, the results are presented. Therefore, hypothesis 6 could not be supported.

Table 6 *Moderating effects on behavioural intention*

		β	**SE**	**p**
Performance expectancy	Age	.02	.05	.55
	Gender	-.22	.13	.09
Effort expectancy	Age	-.07	.07	.27
	Gender	-.23	.20	.25
Social influence	Age	-.02	.04	.68
	Gender	-.08	.12	.53
Hedonic motivation	Age	.11	.07	.12
	Gender	.01	.19	.96
Perceived risk	Age	-.02	.05	.66
	Gender	-.05	.15	.74
Perceived security	Age	-.01	.05	.79
	Gender	-.09	.12	.46

Table 7 *Overview of the results of the tested hypotheses*

No	Hypothesis	Outcome
H1	Performance expectancy has a positive influence on behavioural intention	Not supported
H2a	Effort expectancy has a positive influence on behavioural intention.	**Supported**
H2b	Effort expectancy has a positive influence on performance expectancy.	Not supported
H3a	Social influence has a positive influence on behavioural intention	**Supported**
H3b	Social influence has a positive influence on perceived trust	**Partly supported**
H4a	Hedonic motivation has a positive influence on behavioural intention	Not supported
H4b	Performance expectancy has a positive influence on hedonic motivation	**Supported**
H4c	Effort expectancy has a positive influence on hedonic motivation	**Supported**
H5	Perceived trust has a positive influence on behavioural intention.	**Partly supported**
H5a	Perceived security will mediate the effect between perceived trust and behavioural intention.	Not supported
H5b	Perceived risk will mediate the effect between perceived trust and behavioural intention.	**Partly supported**
H6	Age will moderate the effects of PE, EE, SI, HM, PT, PS, and PR on behavioural intention.	Not supported

4.3 Empirical model

Based on the outcome of the hypothesis testing the conceptual model is adjusted based on the significant effects between the different constructs. This empirical model is able to explain the behavioural intention related to the adoption of consumer-centric advertising solutions. Insignificant effects are not part of this model because these effects are not able to predict the behavioural intention and are therefore not useful in this research.

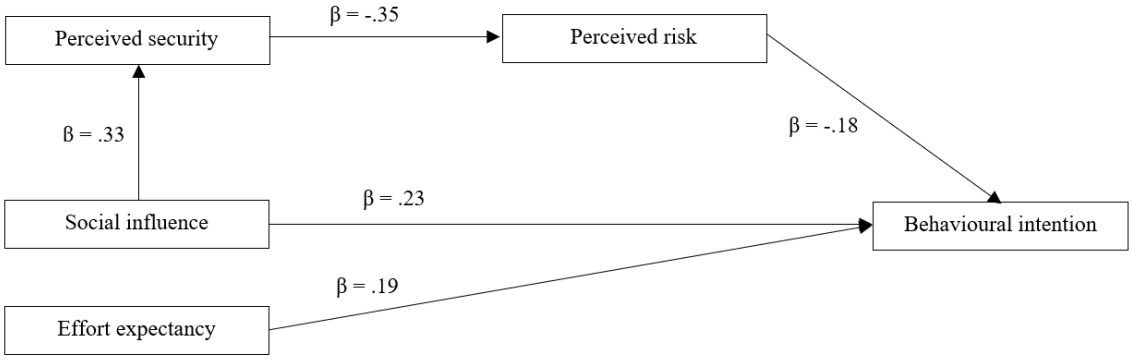


Figure 4 *Empirical model*

5. Discussion

This study has aimed to measure the intention of Dutch internet users to use the Brave web browser. An online survey was conducted to answer which multiple variables influence the behavioural intention of Dutch internet users towards the Brave web browser. Multiple hypotheses were supported and not supported. In this section, the results of this study are reflected on in detail.

5.1 Discussion of results

The main finding of this study is the importance of perceived security, perceived risk and social influence in relation to the adoption of consumer-centric advertising solutions. Particularly, perceived security has a strong influence on behavioural intention. People seem to attach great importance to their security while developing the intention to use the Brave web browser. This study found that the effect of perceived security on behavioural intention is mediated by perceived risk. This implies perceived risk can strengthen or weaken the effect of perceived security and behavioural intention. Since perceived risk is a mediating variable, this implies that in the effect between perceived security and behavioural intention, there is always some level of risk involved. The level of perceived security is influenced by social influence, which indicates that the level of perceived security related to the Brave web browser is influenced by their social environment. In addition to perceived security, perceived risk and social influence, effort expectancy is an important predictor of behavioural intention. This study indicated that people are more likely to use the Brave web browser when they perceive the use relatively free of effort.

Trust is a complex construct that can be defined from different viewpoints and therefore has no universal definition (Mayer, 1995; Blomqvist, 1997), and therefore it is believed that the viewpoint of trust in this research is from a perceived security perspective. This implies that participants in this research base their level of trust on the perceived level of security. Hypothesis 3b and 5a are therefore described as partly supported since perceived security is seen as a form of trust and it was found that perceived risk and social influence, influence the level of perceived security. Therefore, it was decided to replace the construct of perceived trust with perceived security in the conceptual model.

Also, from the results, it was noted that performance expectancy did not have a significant influence on behavioural intention. This aligns with the findings of Zhang et al, (2012), Chong, (2013), Faqih and Jaradat, (2015), Liébana-Cabanillas et al. (2017) and Verkijika, (2018) who described performance expectancy as insignificant in a user-centric context. As described by Venkatesh et al. (2003), performance expectancy seems to be an important predictor in the organizational context. However, it was expected that the Brave web browser was such an improved web browser, performance expectancy could be a significant predictor, based on studies about improved online banking systems (Escobar-Rodríguez & Carvajal-Trujillo, 2014; Workman 2014; Martins et al., 2014; Merhi et al., 2019; Al-Saedi et al., 2020). A possible explanation for the

insignificance of performance expectancy is that respondents do not expect such a relatively big influence of 'just' a web browser on their task performance. Brave will provide a safer and faster browsing experience but the impact on their task performance, such as increasing their productivity, is not expected to be that big because it is 'just' a faster and safer browser compared to other browsers. In addition, it could be difficult for respondents to predict whether the Brave web browser would increase their performance without using the Brave web browser.

In this research, it was also found that effort expectancy had no significant effect on performance expectancy. While several other studies described a significant effect of effort expectancy on performance expectancy (Oliveira et al., 2016; Alalwan et al., 2017; Herero et al., 2017; Verkijika, 2018). However, it is believed that respondents did not believe the Brave web browser is likely to increase their task performance and most of the respondents know the effort it takes to use a web browser. Therefore, effort expectancy has no significant effect on performance expectancy.

This also applies to hedonic motivation. In this research, it was found that hedonic motivation has no significant influence on behavioural intention, while other studies described a significant effect of hedonic motivation on behavioural intention (Venkatesh et al., 2012; Chopdar et al., 2018; Dwivedi et al., 2018; Nikolopoulou et al., 2021). It is believed that hedonic motivation is not significant in this study because of the context of this study. Using a web browser is an everyday task for respondents and therefore using another web browser is not something that derives more fun, entertaining or enjoyable. Unless it was expected that the way how the Brave web browser provides their browsing experience would be at least more enjoyable for respondents.

This study aligns with several studies that described that age and gender have no significant moderating influence when technology is not commonly used (Al-Qeisi et al., 2014; Akinnuwesi et al., 2022). In this study, no significant moderating influence of age and gender on any of the constructs was found. This could also be explained by the fact that most of the respondents perceive the Brave web browser as relatively risk-free, as shown in Appendix A. Several studies argued there is no difference between men and women when adopting a relatively "risk-free" technology this could be a possible explanation of why age and gender do not have significant moderating influence (Riquelme & Rios, 2010; Tan et al., 2014; Liébana-Cabanillas et al., 2018; Farooq et al., 2022). In addition, another possible explanation could be that web browsers are commonly used by all age groups and genders there is no significant difference between age groups and genders.

The only mediating effect that was found in this research was the influence between perceived security and behavioural intention by perceived risk. In this case of mediation, the presence of the mediator's perceived risk is a must. This implies that there is no relationship between perceived security and behavioural intention in the absence of the mediator variable perceived risk. This could also be explained in the context of the Brave web browser. Using a new web browser like Brave, there is a certain level of perceived risk that mediates the influence of perceived security on behavioural intention. Over time, the level of perceived risk might weaken but there is always a certain level of

perceived risk when using the Brave web browser. Therefore, the construct of perceived risk is a mediating variable.

However, unless current debates in society about the way how big tech organizations like Google and Facebook perceive online privacy and security, the results in this study indicate that Dutch internet users do not have the intention at this moment in time to use a more private and security-oriented web browser. This is while organizations like Brave, several newspapers (like the news related to the Cambridge Analytica scandal) and 'privacy and security influencers argue that people are 'done' with Google and/or Facebook. However, based on the results in this research this does not appear to be the case. Brave users are still in the innovators category in the Diffusion of Innovations Theory described by Rogers (1995). Innovators are the 2,5% of the population who first used the technology compared to the rest of the population. Innovators are often younger people, which aligns with the findings of this study: respondents with a relatively younger age have a relatively higher user intention. According to The World Bank (2022) around 4.95 billion people use the internet. Of these people, a total of 2.65 billion (53,53% of all internet users) use Google Chrome (TrueList, 2022), while just 57,4 million internet users use the Brave web browser (0,00011% of all internet users) (Brave, 2022).

As described by Rogers (1995), the Brave web browser can only be remarked as 'successful' when at least 13,5% of the population adopts the Brave web browser. The early adopters are the most important group, as they are the opinion leaders and thus influence the next group of adopters (Rogers 1995). As the result of this study indicated, the social environment of internet users influences their perceived security. While perceived security is seen as the strongest predictor of behavioural intention in this study.

Google was founded 24 years ago (1998) and Facebook was founded 18 years ago (2004) (Livesay, 2022). These companies are household names, while Brave has only been around for 7 years (2015) (Brave, 2022). It is difficult to bring about a major change among all internet users in such a relatively short period when you compete with organizations with this kind of market share. Especially given the fact that Google also aims to improve their online security, privacy and ad frequency (Google, 2022).

Given the current figures, Brave is not expected to win the battle against organizations like Google. However, this is likely to change long term. Ads are becoming big tech's achilles' heel. For example, Google's ad revenue grew just 3% in the last quarter of 2022, down from 43% growth a year ago (Galloway, 2022). This is due to an IOS update of Apple which forces apps on IOS to ask permission to track the personal data of users. Only 16% of the Apple users consent Meta (Facebook and Instagram) to track their personal data. Since data is the oil for online advertising, this caused a huge drop in revenue for Meta. Given that only 16% of all Apple users gave Meta consent to track their personal data indicates that people attach importance to their online privacy. However, on average people are currently not actively aiming to improve their online privacy. Their attitude is

reactive rather than proactive. Therefore, Brave needs to identify online privacy related opinion leaders, find out how they can be reached and can be influenced to increase the number of Brave users.

5.2 Theoretical implication

This study contributes to a theoretical perspective on the adoption of marketing applications that make use of blockchain technology by developing a model that explains the adoption process of a blockchain related marketing solution. This because previous research had limited focus on blockchain related marketing applications (Parssinen et al., 2018; Dutta et al., 2020; Adıgüzel, 2021; Jain et al., 2021). Second, UTAUT 2 does not describe the importance of perceived trust, perceived security or perceived risk. This while these constructs are seen as important construct in explaining the adoption process of IT. This study contributes to the current literature by adding variables to the model that are considered as important in the current IT adoption process. Third, limited studies investigated which constructs influenced perceived trust, perceived security or perceived risk (Shaikh et al., 2018; Basbeth & Sumapraja, 2021). This study found that social influence has a positive influence on the level of perceived security and perceived risk has a mediating role between the effect of perceived security and behavioural intention. Last, this study contributes to the discussion in the current IT adoption literature about the importance of performance expectancy in user-related contexts (Zhang et al, 2012; Chong, 2013; Faqih and Jaradat, 2015; Liébana-Cabanillas et al., 2017; Verkijika, 2018). As no significant effect of performance expectancy on behavioural intention was found, this study contributes to the debate that performance expectancy is an important predictor in organizational contexts only.

5.3 Practical implications

This research contributes to a practical perspective because no study has investigated the intention to adopt alternative advertising solutions, like the Brave web browser. The results of this study could be valuable for organizations that consider using alternative advertising solutions like the Brave web browser. This study confirms and shows organizations how important perceived security and perceived risk are during the adoption process in an online environment. Organizations could use this information while implementing a new system or technology. Another important outcome of this study which contributes to a practical perspective is the effect of social influence on perceived security. This study indicated that social influence has a positive influence on perceived security. This implies that people are more likely to feel secure when people around them also feel secure when using a certain technology or system. Last, the findings of this research emphasized that it is more important to consider the effort expectancy of users than the performance people will expect. Thus, before using an advertising solution like the Brave web browser, users would like to have a clear estimation of the effort it will take while use the solution.

5.4 Future research directions

In this section, the limitations of this study will be appointed and discussed in detail. Based on these limitations, multiple recommendations for future research are appointed. This must ensure that comparative studies will be performed under optimal conditions in the future.

First, the sampling method used in this study is a limitation of this study. In this study, the convenience sampling method and the snowball sampling method are used. Therefore, the respondents of the online survey may not be representative of the population. At least 63,2% of the respondents were below the age of 39. Most of the respondents are therefore relatively young. Since people in all age groups use the internet these days, it would improve the quality of the study when relatively more older people are included in the research. It is therefore recommended to use a truly random sampling method in future research to prevent the distribution of age will be skewed.

Second, the generalizability of this study is a limitation. This study only focused on the Brave web browser and it could be the case that results are different when using another browser. Therefore, it is advised to use larger sample sizes and multiple privacy-focused web browsers (e.g. DuckDuckGo) in future research.

Third, the way how information about the Brave web browser in the online survey is provided is a limitation of this study. When the information provided had for example a more negative tone of voice, it could be possible that the results were different compared to the current results. Another limitation of this study is that respondents were not able to use the Brave web browser. When respondents use the Brave web browser this could provide deeper insights into how they believe the Brave web browser is increasing their performance. Future research should consider this. Future research should also consider using semi-structured interviews instead of an online survey. With semi-structured interviews, it is possible to receive more in-depth information from the respondents, whereas an online survey is relatively limited in the information it receives.

This study found that the statements of perceived trust did not form a valid and reliable construct together. Based on this outcome several assumptions could be made but no clear explanation for this outcome has been found. Therefore, future research should elaborate more on the relation and differences between perceived trust and perceived security. Future research should also focus more on the effect between social influence and perceived security. This study found a significant effect between social influence and perceived security, however social influence is a relatively broad construct with different elements (like family, friends, newspapers, online media, and TV). Future research should elaborate more which on elements of social influence increase or decrease the effect on perceived security. Last, this study only focused on the intention of Dutch internet users, which is a limitation of this study. Future research should focus on other nationalities and/or cultures because internet users with a different nationalities might have other perceptions of perceived security and/or experience with a solution like the Brave web browser which influences the behavioural intention. For

example, the Brave web browser is more regularly used in the United States compared to the Netherlands. Therefore, conducting the same study in the United States might give different results.

6. Conclusion

This research aimed to get insight into the different effects on the behavioural intention of Dutch internet users towards the Brave web browser. Performance expectancy and hedonic motivation had no significant effect on behavioural intention. It is believed that performance expectancy and hedonic motivation are no significant predictors of behavioural intention because internet users believe a web browser will not increase their task performance and their hedonic motivation (e.g., fun, joy). The intention to use the Brave web browser is relatively low, this is because most internet users do not see a difference using different web browsers. Therefore, they do not believe the Brave web browser will make an impact, for example, on their task performance. However, it is expected this will change long term due to the increasing importance of online security.

In this study, perceived security had the strongest effect on behavioural intention. The results of this study describe that social influence has a significant influence on perceived security, the strongest predictor of behavioural intention. This implies that people feel more secure or insecure when their social environment confirms something as secure or insecure.

Given the increasing importance of online security, on long term, people are expected to judge organizations like Google and Facebook more and more on how they deal with online security. When online security becomes an increasingly important topic in the social environment, this will affect the level of perceived security internet users. Therefore, it is expected more internet users will shift towards services who attach increasingly importance to their online security, like the Brave web browser. Organizations like the Brave web browser, should investigate the attitude towards their service because this has a direct and indirect impact on the usage intention. Organizations could respond to this by aiming to change the attitude and decrease the level of perceived risk (e.g., with marketing activities) in the environment of their target group. This because perceived risk mediates the effect between perceived security and behavioural intention.

7. References

Abbas Naqvi, M. H., Jiang, Y., Miao, M., & Naqvi, M. H. (2020, January 1). The effect of social influence, trust, and entertainment value on social media use: Evidence from Pakistan. Cogent Business & Amp; Management, 7(1), 1723825. https://doi.org/10.1080/23311975.2020.1723825

Abrahão, R. D. S., Moriguchi, S. N., & Andrade, D. F. (2016). Intention of adoption of mobile payment: An analysis in the light of the unified theory of acceptance and use of technology (UTAUT). *RAI Revista de Administração e Inovação*, *13*(3), 221–230. https://doi.org/10.1016/j.rai.2016.06.003

Adıgüzel, S. (2021). The impact of blockchain in marketing. *Socrates Journal of Interdisciplinary Social Researches*, *7*(10). https://doi.org/10.51293/socrates.66

Afonso, C. M., Roldán, J. L., & Sánchez-Franco, M. J. (2012). The moderator role of gender in the unified theory of acceptance and use of technology (UTAUT): A study on users of electronic document management Systems. *Conference: 7th International Conference on Partial Least Squares and Related Method*.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-t

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. *Englewood Cliffs, NJ: Prentice-Hal*.

Akinnuwesi, B. A., Uzoka, F. M. E., Fashoto, S. G., Mbunge, E., Odumabo, A., Amusa, O. O., Okpeku, M., & Owolabi, O. (2022). A modified UTAUT model for the acceptance and use of digital technology for tackling COVID-19. *Sustainable Operations and Computers*, *3*, 118–135. https://doi.org/10.1016/j.susoc.2021.12.001

Al Qeisi, K. I., & Al-Abdallah, G. M. (2014). Website design and usage behaviour: An application of the UTAUT model for internet banking in UK. *International Journal of Marketing Studies*, *6*(1). https://doi.org/10.5539/ijms.v6n1p75

Alalwan, A. A., Dwivedi, Y. K., Rana, N. P., & Algharabat, R. (2018). Examining factors influencing jordanian customers' intentions and adoption of internet banking: Extending UTAUT2 with risk. *Journal of Retailing and Consumer Services*, *40*, 125–138. https://doi.org/10.1016/j.jretconser.2017.08.026

Alalwan, A., Dwivedi, Y., & Rana, N. P. (2017). Factors influencing adoption of mobile banking by jordanian bank customers: Extending UTAUT2 with trust. *International Journal of Information Management*, 99–110. https://doi.org/10.1016/j.ijinfomgt.2017.01.002

Al-Lozi, E., Al-Hujran, O., & Al-Debei, M. M. (2014). Get ready to mobile learning : Examining factors affecting college students' behavioral intentions to use M-Learning in saudi arabia. *Jordan Journal of Business Administration*, *10*(1), 111–128. https://doi.org/10.12816/0026186

Al-Saedi, K., Al-Emran, M., Ramayah, T., & Abusham, E. (2020). Developing a general extended UTAUT model for m-payment adoption. *Technology in Society*, *62*, 101293. https://doi.org/10.1016/j.techsoc.2020.101293

Al-Shafi, S., & Weerakkody. (2010). Factors affecting e-government adoption in the state of Qatar. *Semantic scholar*.

Alqahtani, M., & Braun, R. (2021, May 7). Reviewing influence of UTAUT2 factors on cyber security compliance: A literature review. *Journal of Information Assurance &Amp; Cybersecurity*, *2021*, 1–15. https://doi.org/10.5171/2021.666987

Andrews, J. E., Ward, H., & Yoon, J. (2021). UTAUT as a model for understanding intention to adopt AI and related technologies among librarians. *The Journal of Academic Librarianship*, *47*(6), 102437. https://doi.org/10.1016/j.acalib.2021.102437

Arfi, W. B., Nasr, I. B., Kondrateva, G., & Hikkerova, L. (2021). The role of trust in intention to use the IoT in eHealth: Application of the modified UTAUT in a consumer context. *Technological Forecasting and Social Change*, *167*, 120688. https://doi.org/10.1016/j.techfore.2021.120688

Arpaci, I. (2016). Understanding and predicting students' intention to use mobile cloud storage services. *Computers in Human Behavior*, *58*, 150–157. https://doi.org/10.1016/j.chb.2015.12.067

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. *Englewood Cliffs*.

Baruk, A. I., & Iwanicka, A. (2016). The effect of age, gender and level of education on the consumer's expectations towards dairy product packaging. *British Food Journal*, *118*(1), 100–118. https://doi.org/10.1108/bfj-07-2015-0248

BitClave. (2022). *BASE*. https://www.bitclave.com/base

Bleier, A. & Eisenbeiss, M. (2015, september). The importance of trust for personalized online advertising. *Journal of Retailing*, 91(3), 390–409. https://doi.org/10.1016/j.jretai.2015.04.001

Blomqvist, K. (1997). The many faces of trust. *Scandinavian Journal of Management*, *13*(3), 271–286. https://doi.org/10.1016/s0956-5221(97)84644-1

Boeije, H. R. (2009). *Analysis in qualitative research*. SAGE Publications.

Brave. (2022). *Secure, fast & private web browser with adblocker*. Brave Browser. https://brave.com/

Brown, & Venkatesh. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quarterly*, *29*(3), 399. https://doi.org/10.2307/25148690

Business Insider. (2021, 21 april). *533 million facebook users' phone numbers and personal data have been leaked online*. https://www.businessinsider.com/stolen-data-of-533-million-facebook-users-leaked-online-2021-4?international=true&r=US&IR=T

Chao, C. M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01652

Chang, C. T., Hajiyev, J., & Su, C. R. (2017). Examining the students' behavioral intention to use e-learning in azerbaijan? The general extended technology acceptance model for e-learning approach. *Computers & Education*, *111*, 128–143. https://doi.org/10.1016/j.compedu.2017.04.010

Chao, C. M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the UTAUT model. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01652

Chen, P. Y., & Hwang, G. J. (2019). An empirical examination of the effect of self-regulation and the unified theory of acceptance and use of technology (UTAUT) factors on the online learning behavioural intention of college students. *Asia Pacific Journal of Education*, *39*(1), 79–95. https://doi.org/10.1080/02188791.2019.1575184

Chong, A. Y. L. (2013). Predicting m-commerce adoption determinants: A neural network approach. *Expert Systems with Applications*, *40*(2), 523–530. https://doi.org/10.1016/j.eswa.2012.07.068

Chopdar, P. K., Korfiatis, N., Sivakumar, V., & Lytras, M. D. (2018). Mobile shopping apps adoption and perceived risks: A cross-country perspective utilizing the unified theory of acceptance and use of technology. *Computers in Human Behavior*, *86*, 109–128. https://doi.org/10.1016/j.chb.2018.04.017

Davies, J. (2017, March 28). *The gloves are off: The guardian sues rubicon project for undisclosed fees*. Digiday. https://digiday.com/media/gloves-off-guardian-sues-rubicon-project-undisclosed-fees/

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*, 982–1003. doi:10.1287/mnsc.35.8.982

Davis, F., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*. https://doi.org/10.1111/j.1559-1816.1992.tb00945.x

Devarakonda, M. U. T. (2022). "The Social Network": When was Facebook created? How long did it take to create Facebook? USA TODAY. https://eu.usatoday.com/story/tech/2022/07/25/when-was-facebook-created/10040883002/

Dulle, F. W., & Minishi-Majanja, M. (2011). The suitability of the unified theory of acceptance and use of technology (UTAUT) model in open access adoption studies. *Information Development*, *27*(1), 32–45. https://doi.org/10.1177/0266666910385375

Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2017). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical

model. *Information Systems Frontiers*, *21*(3), 719–734. https://doi.org/10.1007/s10796-017-9774-y

Eckhardt, A., Laumer, S., & Weitzel, T. (2009). Who influences whom? Analyzing workplace referents' social influence on it adoption and non-adoption. *Journal of Information Technology*, *24*(1), 11–24. https://doi.org/10.1057/jit.2008.31

Eriksson, K., Kerem, K., & Nilsson, D. (2005). Customer acceptance of internet banking in estonia. *International Journal of Bank Marketing*, *23*(2), 200–216. https://doi.org/10.1108/02652320510584412

Erjavec, J., & Manfreda, A. (2022). Online shopping adoption during COVID-19 and social isolation: Extending the UTAUT model with herd behavior. *Journal of Retailing and Consumer Services*, *65*(22). https://doi.org/10.1016/j.jretconser.2021.102867

Escobar-Rodríguez, T., & Carvajal-Trujillo, E. (2014). Online purchasing tickets for low cost carriers: An application of the unified theory of acceptance and use of technology (UTAUT) model. *Tourism Management*, *43*, 70–88. https://doi.org/10.1016/j.tourman.2014.01.017

Fagih, K. (2013). Exploring the influence of perceived risk and internet self-efficacy on consumer online shopping intentions: Perspective of technology acceptance model. *Al al-Bayt University*, *9*(1).

Farooq, M. U., Su, K., Boubaker, S., & Ali Gull, A. (2022). Does gender promote ethical and risk-averse behavior among CEOs? An illustration through related-party transactions. *Finance Research Letters*, 102730. https://doi.org/10.1016/j.frl.2022.102730

Faqih, K. M., & Jaradat, M. I. R. M. (2015). Assessing the moderating effect of gender differences and individualism-collectivism at individual-level on the adoption of mobile commerce technology: TAM3 perspective. *Journal of Retailing and Consumer Services*, *22*, 37–52. https://doi.org/10.1016/j.jretconser.2014.09.006

Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies*, *59*(4), 451–474. https://doi.org/10.1016/s1071-5819(03)00111-3

Flavián, C., Guinalíu, M., & Gurrea, R. (2006). The role played by perceived usability, satisfaction and consumer trust on website loyalty. *Information & Management*, *43*(1), 1–14. https://doi.org/10.1016/j.im.2005.01.002

Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: An introduction to theory and research. *MA: Addison-Wesley*.

Galloway, S. (2022, November 10). *Elephants in the Room - Scott Galloway*. Medium. https://medium.com/@profgalloway/elephants-in-the-room-31e072ea75ae

Ghosh, A. K., & Swaminatha, T. M. (2001). Software security and privacy risks in mobile e-commerce. *Communications of the ACM*, *44*(2), 51–57. https://doi.org/10.1145/359205.359227

Google. (2022). *Differences between google ads and third-party data - google ads help*. https://support.google.com/google-ads/answer/2375399?hl=en

Guay, F., & Vallerand, R. J. (1996). Social context, student's motivation, and academic achievement: Toward a process model. *Social Psychology of Education*, *1*(3), 211–233. https://doi.org/10.1007/bf02339891

Gupta, B., Dasgupta, S., & Gupta, A. (2008). Adoption of ICT in a government organization in a developing country: An empirical study. *The Journal of Strategic Information Systems*, *17*(2), 140–154. https://doi.org/10.1016/j.jsis.2007.12.004

Haggin, P., & Vranica, S. (2021, October 22). *Apple's Privacy Change Is Hitting Tech and E-Commerce Companies. Here's Why.* WSJ. https://www.wsj.com/articles/apples-privacy-change-is-hitting-tech-and-e-commerce-companies-11634901357?mod=article_inline

Hall, D. T., & Mansfield, R. (1975). Relationships of age and seniority with career variables of engineers and scientists. *Journal of Applied Psychology*, *60*(2), 201–210. https://doi.org/10.1037/h0076549

Heine, C. (2018, 20 maart). 76% of marketing execs say they don't target with behavioral data. https://www.adweek.com/performance-marketing/76-marketing-execs-say-they-dont-target-behavioral-data-156408/

He, X., Stapel, J., Wang, M., & Happee, R. (2022). Modelling perceived risk and trust in driving automation reacting to merging and braking vehicles. *Transportation Research Part F: Traffic Psychology and Behaviour*, *86*, 178–195. https://doi.org/10.1016/j.trf.2022.02.016

Herrero, A., Gutiérrez, H., & Salmones, M. (2017). Explaining the adoption of social networks sites to share user-generated content: A revision of the UTAUT2. *Computers in Human Behavior*, *71*.

Hewavitharana, T., Nanayakkara, S., Perera, A., & Perera, P. (2021). Modifying the unified theory of acceptance and use of Technology (UTAUT) model for the digital transformation of the construction industry from the user perspective. *Informatics*, *8*(4), 81. https://doi.org/10.3390/informatics8040081

Hobbs, T. (2016, 28 oktober). Marketers continue to 'waste money' as only 9% of digital ads are viewed for more than a second. *Marketing Week*. https://www.marketingweek.com/marketers-continue-to-waste-money-as-only-9-of-digital-ads-are-viewed-for-more-than-a-second/

Holdack, E., Lurie-Stoyanov, K., & Fromme, H. F. (2022). The role of perceived enjoyment and perceived informativeness in assessing the acceptance of AR wearables. *Journal of Retailing and Consumer Services*, *65*, 102259. https://doi.org/10.1016/j.jretconser.2020.102259

Hongwei Lin, & Peiji Shao. (2011). Study on operation mode for online advertisement based on competition and vertical integration. *2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)*. https://doi.org/10.1109/aimsec.2011.6010591

Hoque, R., & Sorwar, G. (2017). Understanding factors influencing the adoption of mHealth by the elderly: An extension of the UTAUT model. *International Journal of Medical Informatics*, *101*, 75–84. https://doi.org/10.1016/j.ijmedinf.2017.02.002

Hu, P. J., Chau, P. Y. K., Sheng, O. R. L., and Tam, K. Y. Examining the technology acceptance model using physician acceptance of telemedicine technology, *Journal of Management Information Systems (16:2*), 1999, pp. 91- 112

IBM. (2022). *IBM Blockchain - Enterprise Blockchain Solutions & Services*. https://www.ibm.com/blockchain

Im, I., Kim, Y., & Han, H. J. (2008). The effects of perceived risk and technology type on users' acceptance of technologies. *Information & Management*, *45*(1), 1–9. https://doi.org/10.1016/j.im.2007.03.005

Isaias, P., Reis, F., Coutinho, C., & Lencastre, J. A. (2017). Empathic technologies for distance/mobile learning: An empirical research based on the unified theory of acceptance and use of technology (UTAUT). *Interactive Technology and Smart Education*, *14*(2). https://doi.org/10.1108/ITSE-02-2017-0014

Jain, D., Dash, M. K., Kumar, A., & Luthra, S. (2021). How is Blockchain used in marketing: A review and research agenda. *International Journal of Information Management Data Insights*, *1*(2), 100044. https://doi.org/10.1016/j.jjimei.2021.100044

Kabra, G., Ramesh, A., Akhtar, P., & Dash, M. K. (2017). Understanding behavioural intention to use information technology: Insights from humanitarian practitioners. *Telematics and Informatics*, *34*(7), 1250–1261. https://doi.org/10.1016/j.tele.2017.05.010

Karazsia, B. T., & Berlin, K. S. (2018). Can a mediator moderate? Considering the role of time and change in the mediator-moderator distinction. *Behavior Therapy*, *49*(1), 12–20. https://doi.org/10.1016/j.beth.2017.10.001

Khalilzadeh, J., Ozturk, A. B., & Bilgihan, A. (2017). Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry. *Computers in Human Behavior*, *70*, 460–474. https://doi.org/10.1016/j.chb.2017.01.001

Kim, M. J., Chung, N., & Lee, C. K. (2011). The effect of perceived trust on electronic commerce: Shopping online for tourism products and services in south korea. *Tourism Management*, *32*(2), 256–265. https://doi.org/10.1016/j.tourman.2010.01.011

Kotila, R. Cuevas Rumin, and S. Dhar (2016), "Compendium of ad fraud knowledge for media investors," *WFA Global Transparency Group*.

Kousloglou, M., Nikolopoulou, K., & Hatzikraniotis, E. (2021). A survey on m-learning of secondary school teachers in greece. *12th Panhellenic and International Conference, ETPE*.

Lallmahomed, M. Z., Ab.Rahim, N. Z., Ibrahim, R., & Rahman, A. A. (2013). Predicting different conceptualizations of system use: Acceptance in hedonic volitional context (facebook). *Computers in Human Behavior*, *29*(6), 2776–2787. https://doi.org/10.1016/j.chb.2013.07.018

Lee, J. H., & Song, C. H. (2013). Effects of trust and perceived risk on user acceptance of a new technology service. *Social Behavior and Personality: an international journal*, *41*(4), 587–597. https://doi.org/10.2224/sbp.2013.41.4.587

Leong, L. Y., Hew, T. S., Ooi, K. B. & Dwivedi, Y. K. (2020, December). Predicting trust in online advertising with an SEM-artificial neural network approach. *Expert Systems with Applications, 162*, 113849. https://doi.org/10.1016/j.eswa.2020.113849

Li, X., Hess, T. J., & Valacich, J. S. (2008, March). Why do we trust new technology? A study of initial trust formation with organizational information systems. *The Journal of Strategic Information Systems, 17(1*), 39–71. https://doi.org/10.1016/j.jsis.2008.01.001

Lian, J. W., & Yen, D. C. (2014). Online shopping drivers and barriers for older adults: Age and gender differences. *Computers in Human Behavior*, *37*, 133–143. https://doi.org/10.1016/j.chb.2014.04.028

Liébana-Cabanillas, F., Marinković, V., & Kalinić, Z. (2017). A SEM-neural network approach for predicting antecedents of m-commerce acceptance. *International Journal of Information Management*, *37*(2), 14–24. https://doi.org/10.1016/j.ijinfomgt.2016.10.008

Liébana-Cabanillas, F., Sánchez-Fernández, J., & Muñoz-Leiva, F. (2014). Antecedents of the adoption of the new mobile payment systems: The moderating effect of age. *Computers in Human Behavior*, *35*, 464–478. https://doi.org/10.1016/j.chb.2014.03.022

Liu, S. Q., & Mattila, A. S. (2017). Airbnb: Online targeted advertising, sense of power, and consumer decisions. *International Journal of Hospitality Management, 60*, 33-41.

Livesay, J. U. T. (2022). *How old is Google? History of the world's most popular search engine.* USA TODAY. https://eu.usatoday.com/story/tech/2022/06/19/how-old-is-google/7652870001/

MacKenzie, S. B., & Lutz, R. J. (1989). An empirical examination of the structural antecedents of attitude toward the ad in an advertising pretesting context. *Journal of Marketing*, *53*(2), 48. https://doi.org/10.2307/1251413

Martins, C., Oliveira, T., & Popovič, A. (2014). Understanding the internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, *34*(1), 1–13. https://doi.org/10.1016/j.ijinfomgt.2013.06.002

Maillet, R., Mathieu, L., & Sicotte, C. (2015). Modeling factors explaining the acceptance, actual use and satisfaction of nurses using an electronic patient record in acute care settings: An extension of the UTAUT. *International Journal of Medical Informatics*, *84*(1), 36–47. https://doi.org/10.1016/j.ijmedinf.2014.09.004

Mathews, L. (2019, 17 april). *A dangerous flaw in popular ad blockers put 100 million users at risk*. Forbes. https://www.forbes.com/sites/leemathews/2019/04/17/a-dangerous-flaw-in-popular-ad-blockers-put-100-million-users-at-risk/?sh=1f5022a161d5

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *The Academy of Management Review*, *20*(3), 709. https://doi.org/10.2307/258792

Merhi, M., Hone, K., & Tarhini, A. (2019). A cross-cultural study of the intention to use mobile banking between lebanese and british consumers: Extending UTAUT2 with security, privacy and trust. *Technology in Society*, *59*, 101151. https://doi.org/10.1016/j.techsoc.2019.101151

Minton, H. L. (1980). *Differential psychology*. Brooks/Cole Pub. Co.

Nepomuceno, M. V., Laroche, M., & Richard, M. O. (2014). How to reduce perceived risk when buying online: The interactions between intangibility, product knowledge, brand familiarity, privacy and security concerns. *Journal of Retailing and Consumer Services*, *21*(4), 619–629. https://doi.org/10.1016/j.jretconser.2013.11.006

Oktal, Z. (2013). Kullanıcıların bilgi sistemini kabulünü etkileyen faktörlerin UTAUT perspektifinden incelenmesi. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *31*(1), 153–170. https://doi.org/10.17065/huniibf.103660

Oliveira, T., Thomas, M., Baptista, G., & Campos, F. (2016). Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology. *Computers in Human Behavior*, *61*, 404–414. https://doi.org/10.1016/j.chb.2016.03.030

Parssinen, M. A., Kotila, M., Cuevas Rumin, R., Phansalkar, A., & Manner, J. (2018). Is blockchain ready to revolutionize online advertising? *IEEE Access*, *6*, 54884–54899. https://doi.org/10.1109/access.2018.2872694

Pastor Valles. (2016), An entropy-based methodology for detecting online advertising fraud at scale, *Master Thesis, Universidad Carlos III de Madrid*.

Pantano, E., & Di Pietro, L. (2012). Understanding consumer's acceptance of technology-based innovations in retailing. *Journal of technology management & innovation*, *7*(4), 1–19. https://doi.org/10.4067/s0718-27242012000400001

Plude, D. J., & Hoyer, W. J. (1986). Age and the selectivity of visual information processing. *Psychology and Aging*, *1*(1), 4–10. https://doi.org/10.1037/0882-7974.1.1.4.

PricewaterhouseCoopers. (2019). *Blockchain in advertising - is it the answer to digital advertising's trust and transparency gap?* PwC. https://www.pwc.com/us/en/industries/tmt/assets/2019-blockchain-in-advertising.pdf.

Qin, L., Kim, Y., Hsu, J., & Tan, X. (2011). The effects of social influence on user acceptance of online social networks. *International Journal of Human-Computer Interaction*, *27*(9), 885–899. https://doi.org/10.1080/10447318.2011.555311

Queiroz, M. M., & Fosso Wamba, S. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in india and the USA. *International Journal of Information Management*, *46*, 70–82. https://doi.org/10.1016/j.ijinfomgt.2018.11.021

Ramantoko, G., Putra, G., Ariyanti, M., & Sianturi, N. (2016). Early adoption characteristic of consumers' behavioral intention to use home digital services in indonesia. *Proceedings of the 3rd International Seminar and Conference on Learning Organization (isclo-15)*. https://doi.org/10.2991/isclo-15.2016.17

Razina, T. (2021, 1 februari). *Wetenschappelijke reflectie: Theoretisch model en onderzoeksmethoden (Dutch Edition)*. Uitgeverij Onze Kennis.

Rezaee, E., Saghiri, A. M., & Forestiero, A. (2021). A survey on Blockchain-Based search engines. *Applied Sciences*, *11*(15), 7063. https://doi.org/10.3390/app11157063

Riquelme, H. E., & Rios, R. E. (2010). The moderating effect of gender in the adoption of mobile banking. *International Journal of Bank Marketing*, *28*(5), 328–341. https://doi.org/10.1108/02652321011064872

Rogers, E. M. (1983). Diffusion of innovations. *Free Press, New York*.

Rogers, E. M. (1995). Diffusion of innovations (4th ed.). *New York, NY: The Free Press*.

Rosenberger, P. (2018). Satoshi nakamto. *Bitcoin und Blockchain*, 25–34. https://doi.org/10.1007/978-3-662-56088-4_4

Salameh, A., Fazidah Elias, N., & Abdel Karim, N. (2016). Proposed model for measuring acceptance of online ads. *Medwell Journals*, *2016*(10), 2181–2185. https://www.researchgate.net/profile/Nader-Salameh/publication/313164073_Proposed_Model_for_Measuring_Acceptance_of_Online_Ads/links/5891bc8f92851cda2569f13a/Proposed-Model-for-Measuring-Acceptance-of-Online-Ads.pdf

Salisbury, W. D., Pearson, R. A., Pearson, A. W., & Miller, D. W. (2001). Perceived security and world wide web purchase intention. *Industrial Management & Data Systems*, *101*(4), 165–177. https://doi.org/10.1108/02635570110390071

Sánchez-Prieto, J. C., Olmos-Migueláñez, S., & García-Peñalvo, F. J. (2017). M-learning and pre-service teachers: An assessment of the behavioral intention using an expanded TAM model. *Computers in Human Behavior*, *72*, 644–654. https://doi.org/10.1016/j.chb.2016.09.061

Sebastian, A. (2019, 15 april). *Adblock Plus filter lists may execute arbitrary code in web pages*. Armin. https://armin.dev/blog/2019/04/adblock-plus-code-injection/

Shaikh, A. A., Glavee-Geo, R., & Karjaluoto, H. (2018). How relevant are risk perceptions, effort, and performance expectancy in mobile banking adoption? *International Journal of E-Business Research*, *14*(2), 39–60. https://doi.org/10.4018/ijebr.2018040103

Sharma, S. K., & Sharma, M. (2019). Examining the role of trust and quality dimensions in the actual usage of mobile banking services: An empirical investigation. *International Journal of Information Management*, *44*, 65–75. https://doi.org/10.1016/j.ijinfomgt.2018.09.013

Shin, D. H. (2009). Towards an understanding of the consumer acceptance of mobile wallet. *Computers in Human Behavior*, *25*(6), 1343–1354. https://doi.org/10.1016/j.chb.2009.06.001

Siegrist, M., Gutscher, H., & Earle, T.C. (2005). Perception of risk: The influence of general trust and general confidence. *Journal of Risk Research, 8(2)*, 145-156.

Sun, Q., Willemsen, M. C., & Knijnenburg, B. P. (2020, October). Unpacking the intention-behavior gap in privacy decision making for the internet of things (IoT) using aspect listing. *Computers &Amp; Security*, *97*, 101924. https://doi.org/10.1016/j.cose.2020.101924

Tamilmani, K., Rana, N. P., Wamba, S. F. & Dwivedi, R. (2021, april). The extended unified theory of acceptance and use of technology (UTAUT2): A systematic literature review and theory evaluation. *International Journal of Information Management*, 57, 102269. https://doi.org/10.1016/j.ijinfomgt.2020.102269

The World Bank. (2022). *Individuals using the internet (% of population) | data*. WDI. https://data.worldbank.org/indicator/IT.NET.USER.ZS

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, *15*(1), 125. https://doi.org/10.2307/249443

Tosuntaş, B., Karadağ, E., & Orhan, S. (2015). The factors affecting acceptance and use of interactive whiteboard within the scope of FATIH project: A structural equation model based on the unified theory of acceptance and use of technology. *Computers & Education*, *81*, 169–178. https://doi.org/10.1016/j.compedu.2014.10.009

TrueList. (2022, July 20). *Google Chrome Statistics - TrueList 2022*. https://truelist.co/blog/google-chrome-statistics/

Tsai, Y. Y., Chao, C. M., Lin, H. M., & Cheng, B. W. (2017). Nursing staff intentions to continuously use a blended e-learning system from an integrative perspective. *Quality & Quantity*, *52*(6), 2495–2513. https://doi.org/10.1007/s11135-017-0540-5

Tynan, D. (2020, 1 juli). *WhatsApp privacy backlash: Facebook angers users by harvesting their data*. The Guardian. https://www.theguardian.com/technology/2016/aug/25/whatsapp-backlash-facebook-data-privacy-users

Van der Heijden, H., Verhagen, T., & Creemers, M. (2003). Understanding online purchase intentions: Contributions from technology and trust perspectives. *European Journal of Information Systems*, *12*(1), 41–48. https://doi.org/10.1057/palgrave.ejis.3000445

Venkatesh, Thong, & Xu. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157. https://doi.org/10.2307/41410412

Venkatesh, Viswanath and Thong, James Y.L. and Xu, Xin, Unified theory of acceptance and use of technology: A synthesis and the road ahead (May 1, 2016). *Journal of the Association for Information Systems*, Vol. 17, No. 5 (2016), pp. 328–376.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly*, *27*(3), 425–468.

Verkijika, S. F. (2018). Factors influencing the adoption of mobile commerce applications in cameroon. *Telematics and Informatics*, *35*(6), 1665–1674. https://doi.org/10.1016/j.tele.2018.04.012

Volovich, K. (2020, 7 januari). *What's a Good Clickthrough Rate? New Benchmark Data for Google AdWords*. https://blog.hubspot.com/agency/google-adwords-benchmark-data#:%7E:text=Cost%2DPer%2DAction-,Average%20Clickthrough%20Rate%20(CTR),0.35%25%20for%20a%20display%20ad.

Wang, J., Shahzad, F., Ahmad, Z., Abdullah, M., & Hassan, N. M. (2022, April). Trust and consumers' purchase intention in a social commerce platform: A meta-analytic approach. *SAGE Open, 12*(2), 215824402210912. https://doi.org/10.1177/21582440221091262

Weber, R. (2012, January). Evaluating and Developing Theories in the Information Systems Discipline. *Journal of the Association for Information Systems*, *13*(1), 1–30. https://doi.org/10.17705/1jais.00284

Wei, Z., Zhao, Z. & Zheng, Y. (2019, February 11). Following the majority: Social influence in trusting behavior. *Frontiers in Neuroscience*, *13*. https://doi.org/10.3389/fnins.2019.00089

Workman, M. (2014). New media and the changing face of information technology use: The importance of task pursuit, social influence, and experience. *Computers in Human Behavior*, *31*, 111–117. https://doi.org/10.1016/j.chb.2013.10.008

Zhang, L., Tan, W., Xu, Y., & Tan, G. (2011). Dimensions of perceived risk and their influence on consumers' purchasing behavior in the overall process of B2C. *Lecture Notes in Electrical Engineering*, 1–10. https://doi.org/10.1007/978-3-642-24823-8_1

Zhang, L., Zhu, J., & Liu, Q. (2012). A meta-analysis of mobile commerce adoption and the moderating effect of culture. *Computers in Human Behavior*, *28*(5), 1902–1911. https://doi.org/10.1016/j.chb.2012.05.008

Zhang, X., & Yu, X. (2020). The impact of perceived risk on consumers' Cross-Platform buying behavior. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.592246

Zhou, T. (2012). Examining location-based services usage from the perspectives of united theory of acceptance and use of technology and privacy risk. *Journal of Electronic Commerce Research*, *13*(2), 135–144.

8. Appendices

8.1 Appendix A – Descriptives statistics

Table 8: descriptive statistic for each age group per gender

Construct	Age	Gender	Mean	N	Standard deviation
Performance expectancy	18 thru 28	Male	2,7	44	.72
		Female	2,8	36	.62
	29 thru 38	Male	3,1	42	.78
		Female	3,0	17	1,0
	39 thru 48	Male	3,0	24	.80
		Female	2,5	13	.77
	49 thru 58	Male	3,0	15	.88
		Female	2,9	11	.70
	59 thru 68	Male	3,1	13	.68
		Female	2,8	5	.73
Effort expectancy	18 thru 28	Male	1,9	44	.33
		Female	1,8	36	.46
	29 thru 38	Male	1,9	42	.26
		Female	2,1	17	.60
	39 thru 48	Male	2,0	24	.62
		Female	2,3	13	.65
	49 thru 58	Male	2,0	15	.37
		Female	2,4	11	.68
	59 thru 68	Male	2,0	13	.49
		Female	2,8	5	1,0
Social influence	18 thru 28	Male	2,9	44	.69
		Female	2,8	36	.69
	29 thru 38	Male	3,2	42	.69
		Female	3,0	17	.82

	39 thru 48	Male	3,2	24	3.2
		Female	2,8	13	2.8
	49 thru 58	Male	3,6	15	.72
		Female	3,0	11	.89
	59 thru 68	Male	3,6	13	.63
		Female	3,0	5	.70
Hedonic motivation	18 thru 28	Male	2,7	44	.54
		Female	2,7	36	.63
	29 thru 38	Male	3,0	42	.49
		Female	3,0	17	.65
	39 thru 48	Male	2,9	24	.50
		Female	3,0	13	.40
	49 thru 58	Male	3,1	15	.63
		Female	3,0	11	.30
	59 thru 68	Male	3,2	13	.59
		Female	3	5	.00
Perceived risk	18 thru 28	Male	3,7	44	.76
		Female	3,7	36	.65
	29 thru 38	Male	3,7	42	.69
		Female	3,7	17	.56
	39 thru 48	Male	3,6	24	.76
		Female	3,9	13	.49
	49 thru 58	Male	3,6	15	.73
		Female	3,5	11	.52
	59 thru 68	Male	3,6	13	.76
		Female	3,8	5	1,0
Perceived security	18 thru 28	Male	2,4	44	.54
		Female	2,6	36	.72
	29 thru 38	Male	2,8	42	.78
		Female	2,8	17	.92

	39 thru 48	Male	3,0	24	.72
		Female	2,9	13	.64
	49 thru 58	Male	3,4	15	.63
		Female	2,8	11	.87
	59 thru 68	Male	3,3	13	.63
		Female	2,6	5	.54
Behavioural intention	18 thru 28	Male	2,7	44	.69
		Female	2,8	36	.95
	29 thru 38	Male	2,9	42	.78
		Female	3,1	17	.60
	39 thru 48	Male	3,0	24	.82
		Female	2,9	13	.86
	49 thru 58	Male	3,2	15	.59
		Female	3,0	11	.53
	59 thru 68	Male	3,5	13	.70
		Female	3,0	5	.60

Table 9: descriptive statistic for each age group

Construct	Age	Mean	N	Standard deviation
Performance expectancy	18 thru 28	2,80	80	.68
	29 thru 38	3,10	59	.84
	39 thru 48	2,86	37	.82
	49 thru 58	3,0	26	.80
	59 thru 68	3,05	18	.72
Effort expectancy	18 thru 28	1,87	80	.40
	29 thru 38	2,01	59	.39
	39 thru 48	2,16	37	.64
	49 thru 58	2,03	26	.56

	59 thru 68	2,27	18	.75
Social influence	18 thru 28	2,88	80	.69
	29 thru 38	3,18	59	.73
	39 thru 48	3,08	37	.92
	49 thru 58	3,38	26	.85
	59 thru 68	3,50	18	.70
Hedonic motivation	18 thru 28	2,75	80	.58
	29 thru 38	3,01	59	.54
	39 thru 48	2,94	37	.46
	49 thru 58	3,11	26	.51
	59 thru 68	3,16	18	.51
Perceived risk	18 thru 28	3,71	80	.71
	29 thru 38	3,76	59	.65
	39 thru 48	3,75	37	.68
	49 thru 58	3,57	26	.64
	59 thru 68	3,66	18	.84
Perceived security	18 thru 28	2,50	80	.63
	29 thru 38	2,86	59	.81
	39 thru 48	3,97	37	.68
	49 thru 58	3,15	26	.78
	59 thru 68	3,11	18	.67
Behavioural intention	18 thru 28	2,76	80	.81
	29 thru 38	3,01	59	.73
	39 thru 48	3,02	37	.83
	49 thru 58	3,19	26	.56
	59 thru 68	3,38	18	.60

8.2 Appendix B - Informed consent

Dear Participant,

This survey is conducted as part of my Master thesis project that is part of the Master Communication Science at the University of Twente. In this survey you are asked several 5 - point likert scale questions as well as several filter questions (age, gender, etc.). Your response will be analyzed to understand the behavioural intention of Dutch internet users to use the Brave web browser. Brave is a free and open-source web browser which automatically blocks online advertisements and website trackers in its default settings. It also provides users the choice to turn on optional ads that pay users for their attention in the form of Basic Attention Tokens (BAT), which are tokens you can spend online. The transactions of these tokens are stored based on blockchain technology.

This research can be of value because it could provide information about the intention of Dutch internet user to use blockchain-based advertising solutions.

Your answers are very valuable for our research. Therefore, we ask you to read each question carefully and give us your honest opinion. This survey will take 10 - 15 minutes of your time. The questions are treated confidentially and anonymously.

All data is collected and processed anonymously, and personal information such as age, gender, is gathered only for analysis and validation purposes. Therefore it is not possible to delete data after the participant has completed and sent in the survey. Participants are free to withdraw from the survey at any moment while filling out the survey. If you have any questions or would like more information about this research, please contact me: j.mutsaers@student.utwente.nl.

Thank you for participating.

By ticking the box below, you consent that the information obtained through this survey can be used for the research purpose specified above. If you don't want to consent to this, please tick the disagree box and you will be led to the end of the survey.

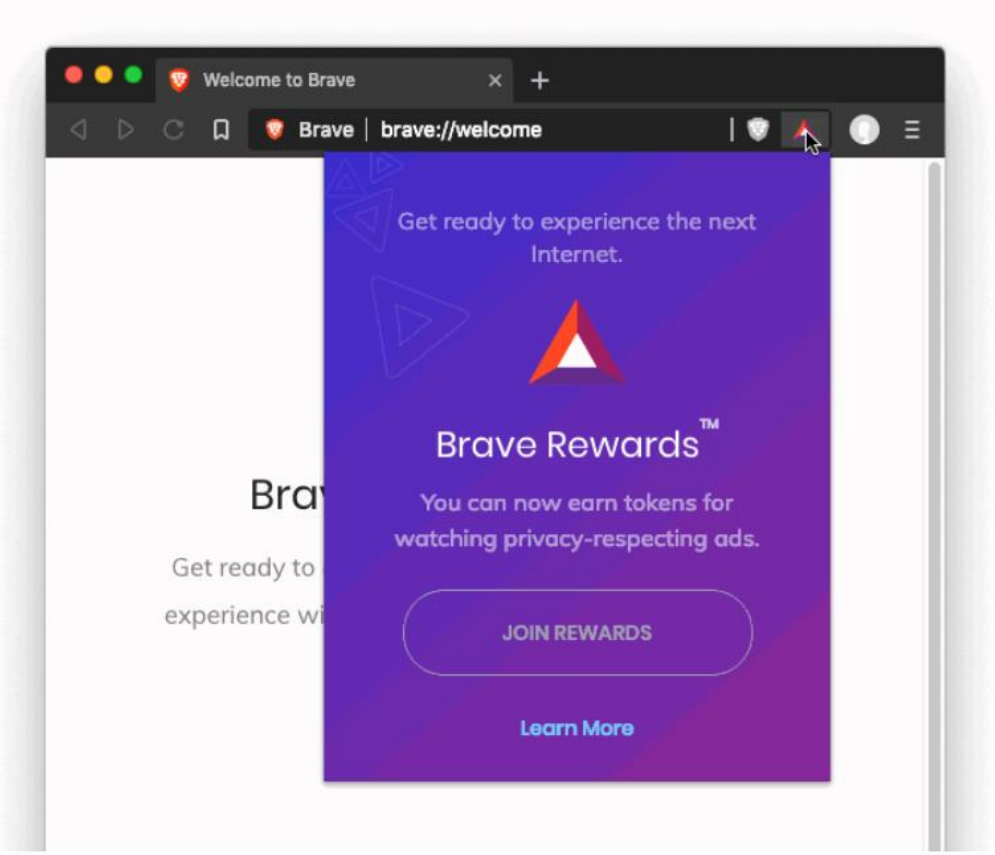
- o Agree, continue to survey
- o Not agree

8.3 Appendix C – Information about Brave

Based on the information in this section, I would like to ask you to give your opinion about the Brave web browser in the next section. First, I would like to ask you to read the text below.

Brave is a free and open-source web browser which automatically blocks online advertisements and website trackers in its default settings. It also provides users the choice to turn on optional ads that pay users for their attention with Basic Attention Tokens (BAT), which are tokens you can spend online. The transactions of these tokens are stored based on blockchain technology. Brave ads presented are based on your interests, as inferred from your browsing behavior. According to Brave, no personal data or browsing history ever leaves the Brave web browser.

The navigation within the Brave web browser is similar to Google Chrome or other web browsers. The video below is an example of the look and feel of the Brave web browser.



Last, I would like to ask you to watch this short video about the Brave web browser. This video aims to inform you about the Brave advertising model.

8.4 Appendix D – Survey questions

Construct	Questions
Performance Expectancy	I believe…
Venkatesh et al. (2012)	The Brave web browser is useful in my daily life. Using the Brave web browser increases my chances of achieving things that are important to me. Using the Brave web browser helps me accomplish things more quickly. Using the Brave web browser increases my productivity.
Effort Expectancy	I believe…
Venkatesh et al. (2012)	Learning how to use the Brave web browser is easy for me. The interaction with the Brave web browser is clear and understandable. The Brave web browser is easy to use. It is easy for me to become skillful at using the Brave web browser
Social influence	I believe…
Venkatesh et al. (2012)	People who are important to me think that I should use the Brave web browser People who are important to me think that my browsing behaviour is risky People who influence my behavior think that I should use the Brave web browser People who influence my behavior think that I should attach more importance to my online security People whose opinions I value prefer that I use the Brave web browser People who are important to me think that I prefer is not trustworthy
Hedonic Motivation	I believe…
Venkatesh et al. (2012)	Using the Brave web browser is fun. Using the Brave web browser is enjoyable. Using the Brave web browser is entertaining.
Perceived trust	I believe…
(Maqableh et al. 2021)	The Brave web browser is trustworthy I will trust the information Brave provides to be true Brave does respect and would not abuse my private information and browsing log history Brave gives me a reason to trust Brave
Perceived security	I believe…
(Salisbury et al., 2001)	I would feel secure sending sensitive information using the Brave web browser

	The Brave web browser is a secure means through which to send sensitive information I would feel totally safe providing sensitive information about myself while using the Brave web browser. I would have no concerns about giving out sensitive information over the Brave web browser. I would give out sensitive information over the Brave web browser. Overall, the Brave web browser is a safe place transmit sensitive information.
Perceived risk	I believe…
Featherman & Pavlou, (2003)	Using the Brave web browser subjects my personal information to potential fraud. Using the Brave web browser would lead me to a loss of privacy because my personal information would be used without my knowledge. Other people might take control of my personal data if I use the Brave web browser. I think using the Brave web browser puts my privacy at risk
Behavioral Intention	I believe…
Venkatesh et al. (2012)	I intend to continue using the Brave web browser in the future. I will use the Brave web browser in my daily life. I plan to use the Brave web browser frequently. Instead of Google Chrome, Microsoft Edge etc. I plan to use the Brave web browser as my main browser.
Age	What is your age?
Gender	What is your gender?
	Male Female Other I prefer not to say
Experience_browser	Which web browser do you describe as your most used browser?
	Google Chrome Firefox Microsoft Edge Safari Samsung internet Opera Other I do not use the internet
Experience_brave	Do you have experience using the Brave web browser?
	Yes No
Experience_adblockers	Are you currently using or did you ever used Ad-Blockers?
	Yes

	No
Experience_blockchain	I am familiar with blockchain technology
	Strongly agree Agree Neither agree or disagree Disagree Strongly disagree

8.5 Appendix E – Important articles

Construct	Framework	Context
Venkatesh et al. (2003)	UTAUT	
Venkatesh et al. (2012)	UTAUT 2	
Lee & Song, (2013)	UTAUT + perceived trust + perceived risk	CeDA service
Featherman & Pavlou, (2003)	TAM + perceived risk	E-service
Shin, (2009)	UTAUT + attitude + perceived security + trust + self efficiacy	
Salisbury et al. (2001)	TAM + perceived security	World Wide Web purchase intention
Flavián & Guinalíu, (2006)	Perceived security + trust + loyality	E-commerce
Kim et al, (2011)	Perceived security + trust + satisfaction + loyalty + navigation functionality + transaction costs	E-commerce
Maqableh et al, (2021)	Perceived security + satisfaction + trust + perceived privacy + addiction	Information systems
Nepomuceno et al, (2014)	Perceived risk + perceived privacy + perceived security + brand familiarity + knowledge	E-commerce
Wamba & Queiroz, (2019)	Performance expectancy + social influence + facilitating conditions + blockchain transparency + trust + behavioural intention	Blockchain
Salameh et al. (2016)	Performance expectancy +	Online advertising

	facilitating condition + social influence + ad environment + ads display + brand name + behavioural tensionon	
Chao, (2019)	Self efficiacy + perceived enjoyment + effort expectancy + performance expectancy + satisfaction + perceived risk + trust + behavioural intention	Mobile learning
Hewavitharana et al. (2021)	Perceived usefulness + perceived ease of use + subjective norm + personal benefits + availability of facilities + perceived risk + attitude towards digitalization	Adoption of digital technologies in the construction industry
Kabra et al. (2017)	Performance expectancy + effort expectancy + social influence + facilitating conditions + trust + personal innovation specific to IT + behavioural intention	Commercial supply chains
Eckhardt et al. (2009)	Performance expectancy + effort expectancy + facilitating conditions + social influence from different departments	Workplace referents
Workman (2014)	Performance expectancy + effort expectancy + social influence + facilitating conditions + experience	The use of new media
Dwivedi et al. (2017)	Performance expectancy + effort expectancy + social influence + facilitating conditions + attitude	Re-examining the UTAUT

Chang et al. (2017)	Subjective norm + experience + perceived enjoyment + computer anxiety + self-efficacy	e-learning
Chopdar et al. (2018)	Performance expectancy + effort expectancy + price value + habit + hedonic motivation + social influence + facilitating conditions + security risk + privacy risk	Mobile shopping apps
Nikolopoulou et al. (2021)	UTAUT 2 + technological pedagogical knowledge	Mobile internet
Dwivedi et al. (2018)	UTAUT 2 + trust + awareness	Mobile services
Pantano & di Pietro, (2012)	Perceived security + perceived cost + perceived risk + trust + skills + abilities + social pressure + hedonic value	Retail
Holdack et al. (2022)	Perceived informativeness + perceived ease of use + perceived usefulness + perceived enjoyment + attitude + behavioural intention	AR wearables
Merhi et al. (2019)	UTAUT 2 + trust + perceived privacy + perceived security	Mobile banking services
Sharma & Sharma, (2019)	Service quality + information quality + system quality + trust + satisfaction + actual usage	Mobile banking services
Alalwan et al. (2015)	Habit + hedonic motivation + trust + self-efficacy + behavioural intention	Internet banking
Al-Saedi et al. (2020)	Performance expectancy + effort	M-payments

	expectancy + perceived risk + perceived trust + perceived cost + self-efficacy + performance expectancy + effort expectancy + social influence + behavioural intention	
Escobar-Rodríguez & Carvajal-Trujillo, (2014)	UTAUT 2 + price saving orientation + innovativeness + trust + information quality + perceived security + perceived privacy	Online shopping
Khalilzadeh et al. 2017	UTAUT 2 + attitude + self-efficacy + perceived security + perceived risk + perceived trust	NFC mobile payment
Martins et al., 2014	Performance expectancy + effort expectancy + social influence + facilitating conditions + performance risk + financial risk + time risk + psychological risk + social risk + privacy risk + overall risk	Internet banking
Arfi et al. 2021	Performance expectanct + effort expectanct + social influence + facilitating conditions + trust + perceived risk	eHealth