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Loyalty programs in Retail: The influence of blockchain technology on customer adoption intention

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Master in Marketing

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Sumário

Com o surgimento das tecnologias emergentes, o *blockchain* destaca-se como um fator de transformação nas relações entre marca e cliente e na melhoria da fidelidade dos consumidores. No entanto, a falta de investigação e de implementação prática, além da associação à cripto moeda, trouxe uma série de desafios, tornando a adoção do *blockchain* mais um incómodo do que uma melhoria. Este estudo tem como objetivo explorar como *blockchain* pode ser aplicada no contexto do marketing, especificamente em programas de fidelidade no retalho, apresentando uma aplicação mais prática.

O estudo usa o *Technology Acceptance Model* para investigar a relação entre utilidade percebida e facilidade de uso, como mediadores, juntamente com três atributos do *blockchain* – transparência, descentralização e imutabilidade – e os efeitos correspondentes na intenção de adoção de programas de fidelidade baseados em *blockchain*. 146 participantes de um questionário foram analisados através de *Exploratory Factor Analysis* e técnicas de regressão.

Os resultados revelam que a descentralização, a imutabilidade e facilidade de uso desempenham papéis críticos na perceção de utilidade, com a facilidade de uso apresentando efeitos diretos e indiretos na intenção de adoção. No entanto, a transparência não mostrou impacto significativo, sugerindo que os utilizadores de programas de fidelidade podem não valorizar a transparência ou considerá-la desnecessária em retalho.

Esta investigação fornece informação valiosa para empresas que desejam implementar programas de fidelidade baseados em *blockchain*, enaltecendo a importância da segurança de dados e do controlo e experiência do cliente para promover a adoção desta tecnologia, o uso e a lealdade a longo prazo.

Palavras-chave: Retalho, Programas de Fidelidade, Tecnologia *Blockchain*, *Technology Acceptance Model*

***JEL Classification System*:** M31; O30

Abstract

In the modern age of emergent technologies, blockchain appears as a game-changer for brand-customer relationships, and customer loyalty behavior enhancement. However, the lack of research, and implementation in day-to-day life, and its association with cryptocurrency has brought a combination of challenges, making blockchain adoption more of a limited nuisance, rather than an upgrade. For that reason, the main objective of this research is to explore in depth and understand how this technology can be applied in a marketing setting, and more specifically in retail loyalty programs, presenting a more day to day application of this technology.

The study applies the Technology Acceptance Model to investigate the relationship between perceived usefulness and ease of use as mediators, alongside three blockchain attributes – transparency, decentralization, and immutability – and their effects on user adoption intention in blockchain-based loyalty programs. Data from 146 survey participants was analyzed through Exploratory Factor Analysis and regression techniques.

The findings show that decentralization, immutability, and perceived ease of use play critical roles in creating a perception of usefulness, with ease of use having both direct and indirect effects on adoption intention and highlighting the importance of creating user-friendly loyalty systems. However, transparency had no significant impact on adoption intention, suggesting that users of retail loyalty programs may not value transparency or may see excess data as overwhelming.

This research provides valuable insight for businesses implementing blockchain-based loyalty programs, suggesting the importance of data security, user control, and seamless user experience to foster user adoption, customer engagement and long-term loyalty.

Keywords: Retail, Loyalty Programs, Blockchain Technology, Technology Acceptance Model

JEL Classification System: M31; O30

Acronym's Glossary

AI – Adoption Intention

DC – Decentralisation

DLT – Distributed Ledger Technology

DOI – Diffusion of Innovation

IM – Immutability

MM – Motivational Model

NFT – Non-Fungible Token

P2P – Peer-to-Peer

PEOU – Perceived Ease of Use

POA – Proof of Authority

POS – Proof of Stake

POW – Proof of Work

PU – Perceived Usefulness

TAM – Technology Acceptance Model

TP – Transparency

USD – United States Dollars

VIF – Variance Inflation Factor

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Introduction

In an era defined by integral technological developments and ever-growing consumer expectations, businesses face the perpetual challenge of fostering brand loyalty amidst a competitive and over-saturated competitive landscape. In response, firms are changing the way they do business by increasing investments in emerging technologies, observing benefits such as lower costs and higher efficiency (V. Kumar et al., 2021), while capably meeting ever-insatiable stakeholder expectations. As such, the emergence of Blockchain technology, with its decentralized and transparent nature, as a database able to securely transfer data and reduce trust costs (Casey & Paul, 2018), presents a novel avenue for redefining traditional customer-brand relationships. Considered part of the Fourth Industrial Revolution (Krafft et al., 2020) and the core building block of Web3 systems (Stackpole, 2022), characterized by peer-to-peer interaction as well as immutable data structures and traceable records (Treiblmaier & Petrozhitskaya, 2023), Blockchain technology has been identified in various potential applications (Abdollahi et al., 2023) such as supply chain management (Saberi et al., 2019) and tourism (Önder & Treiblmaier, 2018; Treiblmaier, 2021; Sarfraz et al., 2023), growing beyond its initial application in cryptocurrency. Although its existence has been recognized for several years now, the slow adoption of blockchain technology by both the industry and scholars alike due to its volatility, uncertainty regarding policies and standardization, and lack of technological knowledge makes its integration a slow process (Dehghani et al., 2022), but academic journals and business alike are already recognizing blockchain as an important and essential technology, as part of the so-called “new-age technologies” - Artificial Intelligence (AI), Internet of Things (IoT), Machine Learning (ML), and Blockchain (V. Kumar et al., 2021) – predicted to have a strong impact on marketing activities for both customers and businesses alike due to its capability of integrating and mining data from various sources and consequently provide new and better experiences in a more intuitive and effortless manner (V. Kumar et al., 2021).

Specifically identified as a technology expected to change and improve customer loyalty programs (Treiblmaier & Petrozhitskaya, 2023; Utz et al., 2023; Lemos et al., 2022), with early research showing that it can “improve customer perception of economy value and satisfy their intrinsic motivations” (Treiblmaier & Petrozhitskaya, 2023), this research aims to explore the key factors influencing customer engagement and adoption intention within the integration of the Technology Acceptance Model (TAM) by Davis (1989)and this emerging technology in a marketing environment while understanding how it can change the current loyalty customer

behavior. It will be developed on the premise that the traditional loyalty program is no longer as advantageous as it was originally intended, and most of the time no longer long-term sustainable. The reality of technology evolution is that customer needs directly change and grow with it, with the technology of today losing its value tomorrow and customer demand differing from yesterday. By adopting blockchain technology in loyalty programs through the Technology Acceptance Model, this research applies an emerging technology on a day-to-day part of retail shopping, while prioritizing the user's perceived usefulness and ease of use, with a strong emphasis on 3 blockchain's factors – transparency, decentralization, and immutability – tackling related topics such as data security, customer freedom of choice and control, and honest data. To achieve market adoption, customers must perceive blockchain-based loyalty programs as useful, and above all, perceive it as an upgrade over traditional loyalty programs, while making it easy to understand and adopt and passing the idea of being the next logical step in technological evolution. Additionally, this research seeks to identify potential challenges and opportunities associated with the adoption of blockchain in retail loyalty programs, by providing theoretical insights and discussing practical implications that can inform strategic decisions for businesses seeking to use and leverage this technology to enhance brand loyalty. This thesis presents 3 main goals: understand to what extent the chosen blockchain properties influence the adoption intention of user's, how perceived usefulness behaves as a mediator, and how perceived ease of use connects both perceived usefulness and user intention to adopt blockchain-based loyalty programs in retail. This research is followed by structure of 6 chapters.

The first chapter is comprised by the literature review of the currently known loyalty program structure, the surge of blockchain technology in business practice, and the moderating effect of the Technology Acceptance Model, working as an introduction to this research conceptual model and first set of hypotheses.

The second chapter combines loyalty programs with blockchain technology providing an overview of its possible purpose in the retail context, while developing and showcasing each of the 3 chosen properties application and importance, and respective remaining hypotheses.

Chapters 3 to 5 are the stage to methodology, analysis and the direct discussion of the results. This is where the conceptual model is developed in accordance with the created hypotheses, starting with Descriptive Analysis, followed by Exploratory Factor Analysis (EFA) and finalized using Regression Analysis. Discussion is then followed, taking place for theoretical and practical implications.

The thesis comes to an end with the sixth chapter, finalized by the main conclusion and respective present limitations and future research possibilities.

1. Literature review and hypothesis development

1.1. Loyalty programs

Loyalty programs have become a strategic tool for businesses aiming to enhance customer satisfaction, retention, and commitment. By offering rewards and incentives as tokens of appreciation, these programs seek to create lasting relationships between customers and organizations (Zakaria et al., 2014), with the relevance and effectiveness of these programs gauged by achieving a specific customer satisfaction threshold (Keh & Lee, 2006). Additionally, this effectiveness is positively related to customer engagement, which enhances the perceived benefits received, and cultivates loyalty (Bolton et al., 2000; Zakaria et al., 2014).

Rewards offered by loyalty programs are usually divided into hard and soft benefits (Zakaria et al., 2014; Mulhern & Duffy, 2004). Hard benefits are tangible, monetary incentives such as rebates, special discounts, and coupons, usually providing immediate financial rewards to customers, viewed as highly attractive. Conversely, soft benefits encompass non-monetary perks and advantages that enhance the overall customer experience beyond just financial incentives. These may include exclusive access to events, personalized services, priority support, and early access to new products (Berry, 1995; Zakaria et al., 2014). Soft benefits play a crucial role by creating a sense of exclusivity and personalized attention, which can significantly contribute to customer loyalty.

Loyalty programs influence customer behavior and psychology in several ways. The Endowed Progress Effect suggests that customers are more likely to remain engaged in a loyalty program if they perceive that they're making progress toward earning rewards (Nunes & Drèze, 2006), a leverageable effect by structuring loyalty programs to provide an initial sense of progress, thereby motivating continued participation.

Furthermore, several theoretical frameworks have been developed to understand the impact of loyalty programs. The Value-Percept Disparity Theory proposes that customer satisfaction arises when there is a positive disparity between perceived value and expectations, often enhanced by the rewards and benefits offered, leading to increased satisfaction and loyalty (Oliver, 1999). On the other hand, the Social Exchange Theory suggests that customers view loyalty programs as a reciprocal and obligational relationship where their loyalty is rewarded by the organization, strengthening the emotional bond and commitment to the brand (Blau et al., 1964). Recent studies have also examined the role of gamification in loyalty programs, finding that game-like elements can increase engagement and motivation (Hamari et al., 2014).

The overall importance of loyalty-focused initiatives and consequently customer loyalty stays undisputed as part of the core of customer relationship management, with the global loyalty management market expected to grow to USD 24.44 billion by 2029 at a compound annual growth rate of 23,5% (*Loyalty Management Market Size, Growth | Global Forecast [2020-2027]*, 2023). Still, the effectiveness and efficiency of current programs are heavily debated. Many authors highlight the positive effects of loyalty programs on customer relationship building by creating a sense of status and belonging to a community (Brashear-Alejandro et al., 2016; Faramarzi & Bhattacharya, 2021) and conclude, that on average, such programs have a positive effect on value. However, the effectiveness of these efforts often falls short of expectations, particularly regarding the low level of participation in loyalty programs, with researchers also pointing at a lack of synergy with customer satisfaction (Kreis & Mafael, 2014; Wang et al., 2019). While reward point-based programs are typically viewed as economic incentives aimed at enhancing customer experiences and fostering purchase retention, relying solely on extrinsic rewards may have negative results, potentially undermining intrinsic motivation and consumer behaviors (Meyer-Waarden, 2013; Wang et al., 2019).

1.1.1. The problem with traditional loyalty programs

As a common marketing strategy, loyalty programs typically entail the accumulation of rewards that can be redeemed for various benefits such as discounts, free products, or upgraded status within the program hierarchy (Treiblmaier & Petrozhitskaya, 2023), focusing on either point accumulation or different benefits to distinct customer segments. At the same time, this rather brand-inclined state remains part of the problem with the current loyalty program's design. A key factor contributing to dwindling customer interest in loyalty points is the failure of current program schemes to align with their personal preferences and motivations. While discounts and freebies remain appealing, they are insufficient to create a meaningful emotion connection between brands and customers. With the evolution of e-commerce, modern customers search for experiences that evoke positive emotions and align with their personal wants and needs. expecting a two-way communication, where they can share feedback and ideas, and foster a sense of community within loyalty programs. Traditional loyalty programs, often lack these engaging opportunities, feeling disconnected and out of touch (Kumar, 2023).

Traditionally, loyalty points are structured around future rewards or deferred rebates, imposing constraints on customers regarding the flexibility of redemption options and the timing of utilization. As a result, customers often find themselves restricted in terms of where and when they can effectively utilize their accrued points, creating a disconnection between the

perceived and actual value of loyalty rewards (Kumar, 2023; *Why Loyalty Programs Fail*, 2024). Adding a substantial deficiency of transparency between brands and consumer and data safety issues, this lack of alignment between program mechanics and consumer expectations diminishes the perceived value of loyalty programs and detracts from their appeal as a means of incentivizing customer loyalty (Treiblmaier & Petrozhitskaya, 2023; Wang et al., 2019). Compounding these issues are unnecessary complex rules and redemption processes many loyalty systems impose, leading to frustration and disinterest. Difficult to understand and navigate programs and added lack of transparency not only reduces trust, but also deter customers from participating or even perceiving benefits, leading to loyalty program abandonment.

According to an empirical study done by Gustafsson et al., (2004) in a Swedish telecom company (Treiblmaier & Petrozhitskaya, 2023), most of the members did not perceive any adding value or higher commitment and loyalty, with some research arguing that loyalty programs have less to offer and consequently less value to high-value brands with an already strong and loyal customer base (Faramarzi & Bhattacharya, 2021). Similarly, a report from Bond Brand Loyalty (2016) showed that over one-fourth of all members – a sample of 19,000 consumers – had never redeemed loyalty-based rewards (Treiblmaier & Petrozhitskaya, 2023).

1.2. Blockchain technology

The emergence of Blockchain Technology as a tool for businesses is becoming increasingly prominent, but it is yet to be utilized to its full potential. Firstly, introduced in 2008 by Nakamoto (2008), through its Bitcoin form, Blockchain is a technology that consists of an electronic, distributed ledger capable of creating an immutable database for secure transferring data through a chain of blocks of data in sequential order stored in a decentralized manner throughout all the participating nodes that form the so-called Blockchain (Kumar et al., 2021; Antoniadis & Kontsas, 2019). This decentralization of records ensures that "no single point of weakness exists", lowering the likelihood of data breaches and increasing safety (V. Kumar et al., 2021). Every block is generated for every transaction performed in the blockchain, with previous data unable to be overwritten or erased, creating a permanent, verifiable, and traceable trail of transactions back to the first record (Kumar et al., 2021; Rodeck, 2021), meaning that each user can change information in their own block (through transactions for example), without altering the millions of others connected to the same network (Gleim & Stevens, 2021). The blockchain ledger isn't controlled by any single central entity or authority, being rather

stored as multiple copies on multiple independent computers within a single network (V. Kumar et al., 2021), meaning that no single entity can change the ledger without following a consensus protocol, in which the majority of users on the same single network must agree with through authentication via mathematical algorithms(Casey & Paul, 2018). Since the ledger of each transaction isn't kept centrally, it is instead distributed in all participating nodes (Figure 1.1), the reason why it is called Distributed Ledger Technology (DLT) (Antoniadis & Kontsas, 2019).

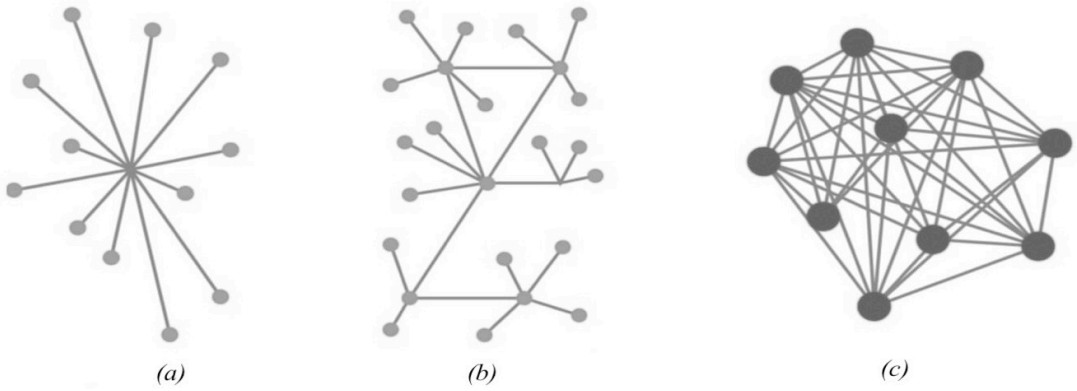

Figure 1.1: *a) centralized networks, b) decentralized networks, c) distributed ledger (Blockchain) by Antoniadis & Kontsas (2019)*

For each new or modified block, a *token* is created during the process which can be used in various ways within the network, such as facilitating digital transactions (cryptocurrencies) or even validating the right to perform an action (Antoniadis & Kontsas, 2019). Due to its difficult but easily verifiable production within a node, and therefore difficult to be altered (Antoniadis & Kontsas, 2019) the use of *tokens* and therefore Blockchain technology facilitates efficient and immutable transactions between different entities without the need for intermediaries, due to its capability to execute them automatically by specifying the conditions under which a transaction may be done, improving process efficiency and cutting down time while assuring safety, value, and autonomy (Antoniadis & Kontsas, 2019; V. Kumar et al., 2021).

In the unique context of Blockchain technology, its implementation through the emergence of smart contracts – digital programs stored on a blockchain able to run automatically when certain predetermined conditions are met (IBM, 2022) –, has changed the way businesses do payments and transactions (Lemos et al., 2022) by eliminating intermediaries in decentralized transactions, but also how brands interact and communicate with stakeholders through digital Marketing and loyalty programs. Each validated block, considered trustworthy, is added to the chain, completing the process and together with Smart contracts, integral to blockchain, store and execute negotiation terms automatically (Lemos et al., 2022; Rijanto, 2021) creating processes characterized by transparency, security and efficiency, by ensuring secure and

unmodifiable data transactions (Rijanto, 2021) with businesses, such as Microsoft, Cathay Pacific, and Air Asia (Sakas et al., 2021) using Blockchain technology to improve Marketing initiatives and enable closer relationships between brands and customers.

Although seen as volatile and speculative due to its cryptocurrency nature, numerous studies have already recognized the potential Blockchain technology brings to various applications, such as supply chain management, payments and transactions, loyalty programs, digital marketing, reviews, and credentials management, and internal marketing management (Lemos et al., 2022). With market growth projections aiming for a value of 39.7 billion USD and more optimistically 176 billion USD by 2025, with expectations of surpassing 3.1 trillion USD by 2030 (Dehghani et al., 2022), the adoption of Blockchain has been seen as a radical disruptor in the way brands communicate and manage marketing mix and marketing programs with many finding the concept of gaining and keeping money as cryptocurrency appealing (Sonmezturk et al., 2020), while major businesses such as Walmart and IBM are already creating and implementing blockchain solutions into their operations and affecting marketing programs (Sharma & Kumar, 2021), underscoring a growing interest in Blockchain-based loyalty programs and cryptocurrency.

Due to the nature of this emergent technology, its benefits for Marketing are unquestionable, with peer-to-peer communication being one of the most relevant features (Lemos et al., 2022), and given its unique attributes Blockchain technology can create a more secure, customer-centric, and open marketplace for consumers and businesses (Gleim & Stevens, 2021), influencing the brand's perception of value, satisfaction, and loyalty and encouraging customers to shop more frequently, while shaping their preferences and decision-making (Lemos et al., 2022). Mitigating intermediaries and increasing efficiency combined with high-quality and transparent data in a private, trustworthy, and secure environment benefits stakeholders and influences attitudes, satisfaction, perception, and perceived risk (Lemos et al., 2022).

However, despite the increasing importance and potential this technology offers for marketing, research on the subject is still underdeveloped (Li et al., 2018) with financial applications being the main focus of this technology, as stated by a PwC survey made in 2018 focused on the development and potential of blockchain in businesses, which reflected an early dominance of this technology in financial services (41%) with an emerging potential in energy and utilities (14%), healthcare (14%), and industrial manufacturing (12%) sectors (PwC, 2018).

As part of this research, we'll further focus on the impact of Blockchain technology in retail loyalty programs, and how customer perception can increase long-term loyalty program engagement.

1.3. The TAM method

First theorized and introduced by Davis, 1989, the technology acceptance model, also known as TAM, has become a widely known framework for analyzing the degree of acceptance of new technologies and understanding how users are likely to adopt and use them, pertaining to an individual or organization's willingness to embrace and integrate a new technology (Esfahbodi et al., 2022). Davis, (1989) also implies the link to, opinion, belief, purpose, and conduct in the technology acceptance model allows us to anticipate the handling of innovative technologies (Raza et al., 2017). According to the model, the intention behind technology adoption is primarily influenced by three key factors: perceived usefulness (PU), perceived ease of use (PEOU), and the user's adoption intention (AI) toward the technology (Davis, 1989).

Despite over-time advancements providing a more comprehensive understanding of user attitudes and their impact on technology adoption, the current research based on the TAM model relationship with blockchain technology offers limited application in consumer environments where users adopt new technologies to fulfill emotional needs (Esfahbodi et al., 2022; Taherdoost, 2018).

With the TAM model allowing the incorporation of external factors as determinants of PU and PEOU, the present study provides insight and examines the effects and influence of blockchain's main features – transparency, decentralization, and immutability – on retail loyalty programs' adoption intention and engagement by integrating them into an adapted TAM framework, an area that lacks academic research in the existing literature (Saberi et al., 2019). This research focuses on the individual customer, particularly within the retail sector, rather than the typical focus on technology adoption and use at organizational levels, discussed by previous studies on TAM and blockchain relationship (Esfahbodi et al., 2022; Kumar Bhardwaj et al., 2021).

By focusing on individual users, this study aims to provide valuable insights for retail brands, helping them to enhance loyalty programs focusing on customer-specific needs and preferences. This user-centered approach contrasts with existing studies and offers an additional perspective on how blockchain can be better integrated into consumer-focused applications such as loyalty programs, aiming to drive higher engagement and usage rates.

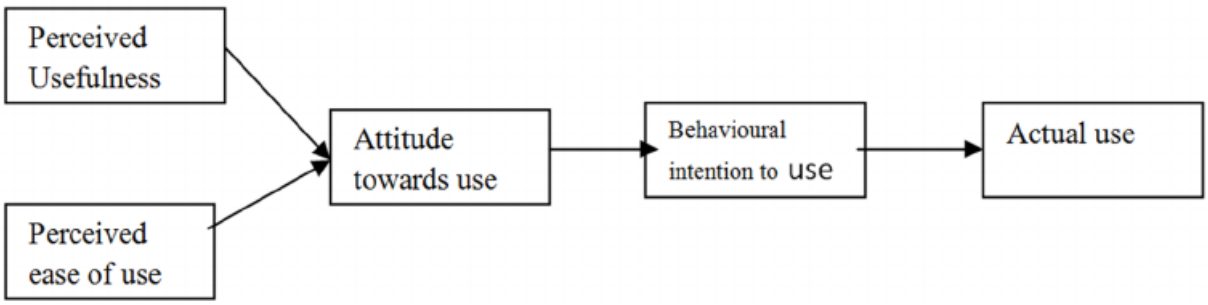

Figure 1.2: *Original technological acceptance model by Davis (1989)*

1.3.1. Perceived usefulness and ease of use

Perceived usefulness is defined as the extent to which an individual believes that utilizing a specific technology or system will enhance their job performance (Davis, 1989). Davis (1989) enforces this concept aligns with the general meaning of useful – "capable of being used advantageously" – widely regarded as a primary determinant in driving the intention to adopt new technologies, as users who perceive technology to be beneficial to their work are more inclined to embrace it (Esfahbodi et al., 2022; Raza et al., 2017). Therefore, a system that is perceived to be highly useful is one that users believe will positively impact their performance, specifically if customers perceive blockchain technology as a valuable tool that can improve efficiency in loyalty programs, making them more likely to view it favorably and provide positive feedback and thereby reinforcing the relationship between the system's utility and the user's success (Davis, 1989; Esfahbodi et al., 2022).

On the other hand, perceived ease of use is defined as the degree to which an individual believes that using a particular technology or system will be free from effort, i.e., to which a user believes that a specific technology or system can be utilized with minimal effort (Davis, 1989; Esfahbodi et al., 2022). Just like perceived usefulness, the concept of ease of use derives from the general understanding of ease, which suggests "freedom from difficulty or significant effort", with "effort" being considered a limited resource that individuals allocate across various tasks and responsibilities personally managed (Davis, 1989). Consequently, according to Davis (1989), with all other factors being equal, a system that is perceived to be easier to use than another is more likely to be accepted and adopted by users, as it demands less effort to operate and integrate into their workflow.

The relationship between perceived usefulness and perceived ease of use is well-established in the literature, with studies (Esfahbodi et al., 2022; Huang & Liao, 2015) demonstrating that perceived ease of use significantly influences users' attitudes and behavioral intentions toward adopting new technology. Both perceived usefulness and ease of use are identified as key

factors in assessing customer acceptance of blockchain technology (Esfahbodi et al., 2022). By considering both, we can gain insight into how these factors influence the likelihood of a blockchain-based loyalty system being used. Esfahbodi et al., (2022) suggests when users find a technology or system easy to use, they are more likely to perceive it as useful, which in turn fosters a positive attitude toward its adoption, proposing that customers are more likely to consider blockchain technology beneficial if it is user-friendly, leading to a more favorable disposition toward its use.

With the integration and adaption of blockchain's main features – transparency, decentralization, and immutability – into the TAM model, based on the understanding of previous research, the following hypotheses are proposed:

H1: *The perceived usefulness of blockchain technology positively affects adoption intention of blockchain-based loyalty programs in retail.*
H2: *The perceived ease of use of blockchain technology positively affects adoption intention of blockchain-based loyalty programs in retail.*
H3: *The perceived ease of use will positively affect users' perceptions of the usefulness of blockchain.*

This study aims to delve deeper into the blockchain determinants influencing users' intention to use and engage with loyalty programs. Among aspects of blockchain technology, Zantalis et al. (2023) reviews four significant features: transparency, decentralization, immutability, and privacy. While Zantalis et al. (2023) considers and studies privacy as a single independent feature, present studies create a correlation with immutability, with privacy characteristics being directly related and a result of the latter (Esfahbodi et al., 2022). For research purposes, privacy features will be studied under "Immutability".

The upcoming sections of this study will explore these key blockchain features – transparency, decentralization, and immutability – and their applications in retail in greater detail, providing a more nuanced understanding of how they influence user intentions in the context of blockchain-based loyalty programs. By focusing on these specific areas, this research seeks to contribute valuable insights into the adoption dynamics of blockchain technology in retail loyalty programs, offering practical implications for academics and industry practitioners.

2. Blockchain-based loyalty programs

One of the core features of blockchain is the ability to easily share information in real-time among a set group of authorized participants, which can increase the supply of goods and services and the range of offerings to consumers due to the enhanced flows of safe and reliable information (Treiblmaier et al., 2021). While typical loyalty programs restrict their users to a limited range of products, usually representing a single brand's range of products and limiting its value due to the use of expiration dates for loyalty points, the exchange and trading of loyalty rewards enables the usage of tokens according to the "rules" of the program, determined by the mentioned before smart contracts on the blockchain, where loyalty points (or tokens) can be stored without expiring. By combining all this with its features, such as easier usage, faster spending, and transferability, Blockchain-technology can create a "multi-vendor" program (Treiblmaier & Petrozhitskaya, 2023), where customers can exchange digital currency with various partner brands, as they enjoy the sense of choice and real agency when it comes to selecting services and functions (Utz et al., 2023).

Due to its open and decentralized nature, blockchain can also create a system that enables peer-to-peer exchange. By building a blockchain-related loyalty program, customers can gain control over their accumulated points and trade them correspondingly with their peers, creating an "open market" where consumers have easy access to data and data sharing, and total control of their data and who has access to it (Treiblmaier & Petrozhitskaya, 2023) . This is further enhanced using the so-called token economy, where goods and services can be exchanged through tokens representing value and the use of non-fungible tokens (NFTs), representing unique assets that can be traded between peers amongst a distributed ledger (Belk et al., 2022).

As a decentralized system made of a chain of blocks containing transactions of any value such as money and identity, Blockchain eliminates the need for the usual centralized control, mitigating points of failure and establishing digital trust without the need for third parties or central authorities (Abdollahi et al., 2023), meaning it does not need to rely on a central point of control, but rather on "consensus protocols" across the network of nodes to conclude any transition (Jung, 2019). In an IBM post "*How transparency through blockchain helps the cybersecurity community"* Jung (2019) said "when its properties of decentralization, immutability, transparency, and security are combined, a notion of "trustlessness" is created", i.e. there's no need to rely on trusting a third party, as the system executes actions without relying on humans to do so (Utz et al., 2023)Clique ou toque aqui para introduzir texto..

Previous survey research confirms that marketing professionals expect Blockchain to have a positive influence on loyalty programs (Lemos et al., 2022), with early research on the subject matter showing that blockchain-based programs can improve customer perception of the value and satisfaction offered by blockchain technology (Wang et al., 2019), through properties such as autonomy and trust, immediate transaction settlement, transferability of redeemed points (or *Tokens)* between separated programs and data safety, anonymity and transparency (Antoniadis & Kontsas, 2019).

In 2018 Singapore Airlines converted its flyer program – KrisFlyer – into a miles-based digital wallet (now KrisPay) that members can use to convert into digital currency for shopping with various partner merchants, which included several merchants ranging from beauty to food services to gas and retail (SingaporeAir, 2018), with Air Asia using the same type of miles benefit scheme (Sakas et al., 2021). The blockchain platform can automate data-filling procedures, enabling a transparent transaction history between brands and customers, improving efficiency, and enabling businesses to provide better experiences (Lemos et al., 2022)..

Just like written in the section before, the correlation between the TAM model and Blockchain's core attributes – transparency, decentralization, and immutability –, as defined by different reviews and exploratory research (Esfahbodi et al., 2022; Grover et al., 2019), becomes crucial to understanding this technology's positive influence on loyalty programs, and will be studied in depth in the next sections.

2.1. Transparency

The implementation of transparency in retail marketing represents a major shift in how loyalty programs are perceived, especially when it comes to blockchain technology. Traditionally, loyalty programs have been shrouded in complexity, with terms, conditions, and rewards mechanisms being unclear or difficult for consumers to fully understand, often leading customers to skepticism, diminished trust, and lower levels of engagement, but blockchain offers a solution by introducing a transparent system capable of recording and verifying every transaction in an immutable ledger securely, with every complete copy of the created blockchain visible to participating customers (Zantalis et al., 2023). By shifting from the typical obscure loyalty system, blockchain-based transparency takes advantage of the technology core attributes – decentralization and immutability – to create a more transparent, reliable and trustworthy system (Hellani et al., 2021) where customers can clearly see how transactions

happen and are tracked in real-time, without relying on the company's internal systems to tell them what happens in the network.

With the introduction of blockchain technology, loyalty programs can provide a "tamper-resistant transaction record stored in a distribution fashion" (Utz et al., 2023) bolstered by advanced cryptographic techniques, which not only secure transaction data but also ensure its integrity. This design ensures that loyalty programs can offer a clear and immutable record of loyalty transactions, including "blocks" of all consumption and generation values, in which customers can verify their rewards, and track tokens and transactions independently, providing accurate and fair programs – through the help of Smart Contracts for example – (Sonmezturk et al., 2020; Utz et al., 2023), while rendering every transaction irreversible, preventing acts of fraud, double spending, and manipulation (Deloitte US, 2016). In addition to improving customer trust and satisfaction, blockchain's transparency also increases the efficiency of loyalty program management. With all transactions being visible and easily auditable, brands can ensure compliance with regulation and reduce the risk of fraud. This level of transparency also allows to better understand customer behavior and preferences, allowing brands to tailor loyalty offerings more effectively (Hellani et al., 2021; Utz et al., 2023).

With the advancement of digital literacy, customers become more demanding of data generation and transparency (Utz et al., 2023), with Blockchain applications reducing "data asymmetry" considerably – when one party owns more information than the other, creating a disparity in access to data (Dodds, 2017; Bloomenthal, 2021) – producing a balanced and equal footing between brands and customers, strengthening the bond between both parties and allowing greater success by granting access to all relevant and verifiable data (Sonmezturk et al., 2020; Utz et al., 2023). Ultimately, the goal is to establish a secure, transparent, and customer-centric framework for rewarding customer loyalty in the ever-changing landscape of retail marketing.

2.1.1. Retail applications

Transaction transparency: fundamental characteristic that sets it apart from traditional centralized systems. In the realm of blockchain technology, transaction transparency is a core feature that plays a crucial role in its functionality, as transaction conducted on a blockchain is meticulously recorded on an immutable, decentralized ledger, which is accessible to all authorized participants within the network. The level of transparency ensures that every aspect of a transaction – such as its origin, destination, and the data associated with it – can be verified by those involved, thereby fostering a higher degree of trust and security. This innovative

approach aims to empower customers by providing clear visibility into how their transactions – which includes physical and digital rewards such as digital currency, loyalty points, etc. – contribute to rewards, the distribution of those rewards, and the specific conditions under which they can be redeemed.

Moreover, the transparent nature of blockchain transactions helps in preventing fraud by making any attempt to alter or falsify transaction data easily detectable. The ability to audit transactions in real-time further enhances accountability, as all actions are recorded and can be reviewed by stakeholders at any time. By removing the traditional opacity of reward programs, retailers can foster stronger relationships with their customers, thereby enhancing both trust and loyalty, delving into the motivations to move towards greater transparency, and prioritize fairness and openness (Zantalis et al., 2023).

Supply-chain transparency: emerges as a fundamental feature of business continuity and high product quality, with the potential to significantly influence the supply chain and transform how customers interact with and perceive a brand's products (Hellani et al., 2021). In traditional supply-chains, the journey of a product from its origin to the final consumer is often "opaque", with limited information available related to the various stages of production, transportation, and handling. This lack of transparency often leads to mistrust and uncertainty, particularly for customers concerned with product authenticity, ethical sourcing, and environmental impact.

Supply-chain transparency, and consequently traceability, described as the ability to identify a product at any stage and viewed as a prerequisite for transparency, allows brands to provide data related to product origin and production processes, giving customers better insight into who produces and how they produce – vital for big themes and concepts like sustainability, ethics and counterfeiting –, and the journey products take before ending up in shelves and consequently in customers possession (Gazzola et al., 2023; Hellani et al., 2021).As a result of this, customers gain more trust and feel more confident when buying from a brand that employs blockchain-technology empowering them to make informed choices, especially when their purchasing decisions are complimented by authentic and immutable information about a products origins, legitimacy, integrity, and custody – people or entities that hand a product in the supply chain – easily established by transparent traceability, certifiability, trackability, and verifiability (Gazzola et al., 2023).

Besides improving the customer experience by providing real-time information about the status and location of orders, assuring accurate and unaltered information data, the benefits of blockchain's transparency extend to improving product safety and quality as well. In cases of product recalls or safety concerns, this technology allows for the quick and efficient

identification and isolation of affected products, and consequently for customers to be notified directly about any issues with the products they have purchased and take the necessary steps to mitigate risks, showing commitment to quality and responsibility (Sharma & Kumar, 2021).

H4: *Blockchain's transparency positively contributes to customer use intention of loyalty programs*

2.2. Decentralization

Blockchain's decentralization is a fundamental concept that refers to the distribution of control, data, and decision-making power across a network of computers (nodes), and rather than being concentrated in a single central authority or server, blockchain stores data in the form of transactions, acting as a decentralized ledger, where peer-to-peer (P2P) transactions are the norm by distributing control and authority across participants, without the need for a central trust node or any other third party to validate the transactions (Utz et al., 2023; Zantalis et al., 2023). Brands can directly and instantly credit acquired points in real-time and create "multi-vendor" programs where multiple entities collaborate in the name of expansion and range of goods and services, while customers can exchange rewards (i.e. loyalty points, tokens, NFTs) and data between each other.

Through this decentralization, brands can decide how and with whom – partner brands for example – the customers use rewards. While loyalty providers still determine the rules and usage of rewards, blockchain simplifies access and management for consumers virtually eliminating friction and coordination inertia to credit points fast for example (Dong et al., 2018; Kumar et al., 2019). As a P2P network, Blockchain allows data to be duplicated, shared, and dispersed across numerous servers, known as nodes (Utz et al., 2023), represented by independent individuals or institutions – usually geographically distributed (Dong et al., 2018).

In a Blockchain system, certain nodes – brands for example – are responsible for grouping transactions into blocks, with each block referencing the preceding one through hash values, used to identify any retroactive alterations to the blockchain easily (Utz et al., 2023; Zhang et al., 2019). Information undergoes verification by all nodes through a specific consensus, replicated across each node, following decentralized and fully autonomous patterns – such as Smart Contracts –, with private Blockchain Networks offering additional features by allowing the allocation of rights to write and access data based on the roles and competencies of each participant, allowing a shared "truth" among participants, while ensuring transparency and

without compromising sensitive information, creating a win-win situation for both brand and customer (Dong et al., 2018; Utz et al., 2023). Blockchain empowers brands to redesign their programs, offering customers greater ownership and flexibility over their rewards, creating a smoother and more satisfying experience (Dong et al., 2018).

2.2.1. Retail applications

P2P transactions: As Bitcoin was initially developed as a decentralized system for peer-to-peer value transfer online, similarly Blockchain-based loyalty programs can be designed to grant customers greater control over accumulated points, allowing them to trade them among peers seamlessly (Treiblmaier & Petrozhitskaya, 2023). Traditional loyalty programs mostly suffer from usage limitations and lack value beyond the scope of the specific program, as the reward points issued by companies are typically confined to their platforms, due to the technology nature and introduction of smart contracts blockchain-based loyalty programs enable the seamless transfer, receipt, and exchange of points, expanding customer privileges (Agrawal et al., 2019; Lemos et al., 2022).

Additionally, the emergence of the token economy and the introduction of non-fungible tokens as unique digital assets tradeable among users in a Blockchain network (Treiblmaier & Petrozhitskaya, 2023), facilitates the exchange of a wide array of exclusive rewards and experiences securely and transparently, while ensuring a wide array of goods and services using tokens as representations of value (Belk et al., 2022; Sonmezturk et al., 2020), with this emphasis on user experience and collaborative consumption in the sharing economy aligning with the objectives of modern loyalty programs, enhancing customer engagement and satisfaction (Klarin & Suseno, 2021; Treiblmaier & Petrozhitskaya, 2023).

Multi-vendor programs: Blockchain technology introduces a paradigm shift by facilitating real-time information sharing among authorized participants. The seamless flow of reliable and secure information creates new ways to enhance the supply of goods and services, streamlining payment settlements, and diversifying offerings to consumers (Treiblmaier et al., 2021; Treiblmaier & Petrozhitskaya, 2023).

Furthermore, this enhancing integration of blockchain technology allows brands to create a type of “multi-vendor” co-branding program, where multiple entities collaborate in the name of expansion and range of rewards and services, from anywhere in the world, through the use of smart contracts and consensus models allowing parties to establish and strengthen agreement between brands (Agrawal et al., 2019) Bacia, 2022). Unlike traditional programs, limited by a single brand offering, the introduction of blockchain-based loyalty programs enhances

consumer choice, by offering a wider and diverse assortment of rewards and fostering a sense of empowerment and freer agency amongst customers, who appreciate the flexibility and freedom to tailor loyalty rewards according to their preferences and needs (Treiblmaier & Petrozhitskaya, 2023), creating a large loyalty community of existing customers and consequently increasing customer engagement and reach, offering a cost-effective solution (Agrawal et al., 2019).

Real-time solutions: Blockchain-based solutions offer a streamlined approach to point distribution, significantly improving customer experience. By introducing blockchain technology, brands can directly credit acquired points in real-time to a consumer's account or digital wallet, making them instantly available for redemption (Stallone et al., 2021; Treiblmaier & Petrozhitskaya, 2023) and mirroring the efficiency of Bitcoin's transaction settlement process where confirmed transactions are considered final after the addition of the necessary blocks – usually taking every 10 minutes on average –, with loyalty points being trackable and verifiable throughout every stage of the supply chain, making way for a more transparent and secure system, in which both brands and customers are provided with greater confidence and trust (Treiblmaier & Petrozhitskaya, 2023).

Some innovative approaches, such as stablecoins, further mitigate volatility and ensure stability in Blockchain-based technology. Stablecoins are a type of privately issued digital tokens pegged to so-called underlying assets or baskets of assets, ranging from traditional government-issued currencies and commodities (such as gold) to cryptocurrencies, intended and structured to provide stability, offering a reliable store of value in the loyalty program panorama, in which brands can deliver a more rewarding experience for customers, through reliability and utility (Caudevilla et al., 2022.; Treiblmaier & Petrozhitskaya, 2023).

H5: *Blockchain's decentralization positively contributes to customer use intention of retail loyalty programs*

2.3. Immutability

In conventional systems, data is housed in databases susceptible to hacking, leading to private breaches. In a Blockchain network, each transaction is verified by digital "signatures" from both the sender and receiver to ensure safety, collaborating to create a secure and reliable network. These interactions are then time-stamped and grouped into so-called blocks, undergoing validation based on the agreement of the majority of the participating nodes, by

following specific rules set by a consensus protocol, and once validated, creating a new block – process identified as mining – with each one having a unique digital signature and being connected to the previous one, forming an unchangeable chain of blocks (V. Kumar et al., 2021; Zantalis et al., 2023). This group of blocks is then stored in encrypted form – cryptographically linked blocks –, providing a highly secure and accessible system (Agrawal et al., 2019) and creating an immutable database for data transferring due to its distributed ledger nature, referred as cryptography-based security (V. Kumar et al., 2021). Once a transaction is authenticated and added to the blockchain ledger, it becomes immutable, resistant to any unauthorized alterations or tampering, enhancing the overall security of the stored data (V. Kumar et al., 2021; Treiblmaier & Petrozhitskaya, 2023).

Nowadays, different consensus algorithms have been developed and suggested, with Proof of Work (PoW), Proof of Stake (PoS) and Proof of Authority (PoA) being the most widely used ones (Dong et al., 2018; Zantalis et al., 2023). A block's digital signature contains crucial information, including the previous block's hashed value, a Merkle tree of transactions, and a unique number called a "nonce", used during block mining. Once any modification alters the block's content, altering its hashed ID, the chain breaks making any subsequent blocks invalid (Zantalis et al., 2023). A block becomes immutable as time progresses, meaning it cannot be altered or removed. This immutability enables nodes to achieve consensus on the entire state by only focusing on the most recent changes (Landerreche & Stevens, 2018.). Smart contracts are another form of consensus, specifically referring to a set of software codes, formed by pre-determined execution conditions, often organized as the "If… then…" conditional form (Dong et al., 2018). Once the execution conditions are satisfied, the execution of the contract – any type or form of transaction and interaction – is automatically triggered without human intervention and third-party supervision, automating workflow by triggering the next action when conditions are met (Dong et al., 2018; IBM, 2022) and feeding into the decentralized P2P form Blockchain takes. This immutability not only allows businesses to accurately verify transactions, reducing the risk of unauthorized changes or manipulations by malicious actors, but customers can also rely on the assured integrity of Blockchain-based loyalty programs, knowing their data and identities are recorded and impossible to be tampered with, increasing confidence and engagement with brands (Onyshchenko, 2023; Treiblmaier & Petrozhitskaya, 2023).

Due to its peer-to-peer nature, reducing the ability of third parties to collect customers information and the possibility to tokenize personal data, users can opt to provide their information anonymously through a distributed ledger, ensuring user privacy by employing

pseudonyms (Esfahbodi et al., 2022; Zantalis et al., 2023), eliminating the need for intermediaries and centralized systems, and allowing customers to store, transfer, and manage loyalty points securely (Antoniadis & Kontsas, 2019) or any other group of data, value, or assets (V. Kumar et al., 2021), without information about the actual user's identity being publicly visible, promoting social responsibility from the brand's side by giving users control over the amount of personal information they reveal (Antoniadis & Kontsas, 2019; Forbes, 2018).

2.3.1. Retail applications

Data personalization: Due to its nature of allowing accurate, timeless, and high-quality data, Blockchain-based loyalty programs allow for a better and more efficient design and delivery of personalized engagement experiences with customers (V. Kumar et al., 2021; Treiblmaier & Petrozhitskaya, 2023), affirming a positive impact on customer satisfaction and further engagement (Beckers et al., 2017; V. Kumar et al., 2021).

Beyond facilitating real-time data access and sharing among network participants, Blockchain allows customers to retain control over personal data and dictate who can access it, (Travizano et al., 2020; Treiblmaier & Petrozhitskaya, 2023). The enhanced control over data security is further augmented by advancements in digital identities, a type of digital ID in which information and data identify an external entity – people, organizations, software programs, other computers – in the digital world through a set of measurable characteristics such as passwords, voice recognition and even digital wallets (Sunde, 2022), enabling individuals to curate personalized offerings and opening avenues for self-determined customization without needing private data, aligning with customers' desire for personalized experiences tailored to their unique needs (Treiblmaier & Petrozhitskaya, 2023).

Never-ending value: In addition, Blockchain-based loyalty programs provide a solution by recording points on its immutable network, preventing expiration (Agrawal et al., 2019). This ensures that customers retain the full value of their points indefinitely and can leverage loyalty points across multiple platforms offering greater flexibility and utility in redeeming rewards.

Conventional loyalty programs suffer mostly from usage limitations, as the reward points issued by companies are not only typically confined to their platforms, but also present expiration dates (Agrawal et al., 2019), lacking value beyond the scope of the specific loyalty program, eliciting negative perceptions when programs pressure customers into redeeming rewards prematurely (Pez et al., 2017; Treiblmaier & Petrozhitskaya, 2023). From the standpoint of a company, it's logical to encourage customers to utilize their accrued loyalty points, aiding in maintaining accurate balance sheets by either prompting consumption or the removal of points

from accounts (Treiblmaier & Petrozhitskaya, 2023), but from the customer's perspective the flexibility of retaining loyalty points, without an imposed expiration date, possible by using Blockchain technology is far preferable.

While Blockchain doesn't necessarily act as an "enabling" technology, due to the possibility of creating traditional loyalty programs without expiration dates, it offers a suite of features, including better-streamlined usage, accelerated spending processes, and enhanced transferability, that collectively contribute to creating systems with greater efficiency, versatility, and adaptability in which the immutable nature of blockchain records facilitates real-time auditing, allowing for accurate assessment of potential liabilities (Treiblmaier & Petrozhitskaya, 2023).

H6: *Blockchain's immutability positively contributes to customer use intention of loyalty programs*

3. Methodology

3.1. Conceptual framework

Figure 3.1 represents the initial proposed conceptual framework of this research, adapted from the tested model created by Esfahbodi et al. (2022) and based on the before mentioned and proposed hypothesis. With the integration of the TAM model, this framework aims to test the impact of blockchain-based features – transparency (TP), decentralization (DC), and immutability (IM) – on the intention to engage with retail loyalty programs. The attributes for each blockchain core feature and perceived usefulness (PU) and perceived ease of use (PEOU) are detailed and presented in Table 4-1, adapted from previous research and identified as independent variables, while measurements for the Adoption Intention (AI) are adapted from research done by Esfahbodi et al. (2022) and Kumar Bhardwaj et al. (2021), identified as dependent variables shown in Table 3.2.

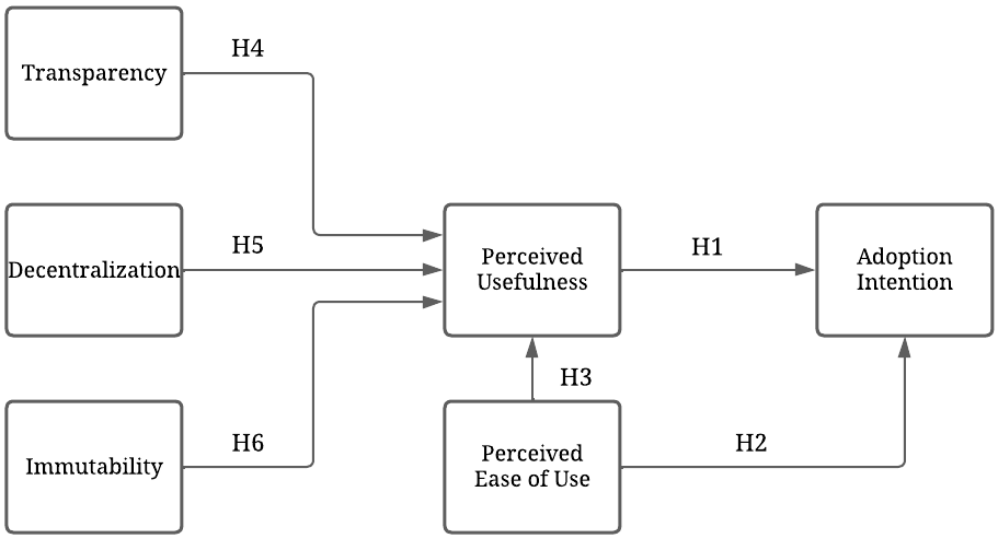

Figure 3.1: *Initial conceptual model*

Table 3.1: *Measurement scale for independent variables*

Independent Variables	Item Code	Measurement Items	Literature Review
Transparency	TP1	Transparent loyalty programs increase integrity and authenticity, adding perceived value to transactions.	Saberi et al. (2019); Sonmezturk et al. (2020); Utz et al. (2023)
	TP2	Transparency reduces data asymmetry between brand and customer.	
	TP3	Transparent systems provide clarity and reduce uncertainty and misunderstandings.	
	TP4	Transparent loyalty programs are more accurate and fair.	
	TP5	Transparency helps me make better and more informed decisions.	
Decentralization	DC1	Decentralized loyalty programs improve the flexibility and versatility of loyalty program transactions.	Agrawal et al. (2019); Treiblmaier & Petrozhitskaya (2023); Utz et al. (2023)
	DC2	Blockchain's decentralization empowers me as a customer.	
	DC3	Decentralization creates cost-effective solutions, increasing the quality and value of loyalty offerings.	
	DC4	By expanding the range of offerings, decentralization gives a better sense of freedom of choice.	
	DC5	Decentralization grants customers greater control over offerings.	
Immutability	IM1	Blockchain's immutability gives me better control of my loyalty program data.	Agrawal et al. (2019); Treiblmaier & Petrozhitskaya
	IM2	Immutability resolves pressure-related problems (such as pressure to use rewards), making the program more versatile and adaptable.	

	IM3	Immutability allows for more accurate and high-quality data, increasing my confidence in the loyalty program.	(2023); Zantalis et al. (2023)
	IM4	Through blockchain's immutability, customized experiences can create better and more efficient program designs.	
	IM5	Blockchain's immutability can reduce fraud and manipulation, increasing security and trust in loyalty programs.	
PU	PU1	Blockchain technology improves the effectiveness of loyalty programs.	Esfahbodi et al. (2022); Kumar Bhardwaj et al. (2021)
	PU2	Blockchain technology improves the performance of loyalty programs.	
	PU3	Blockchain technology can be useful in loyalty programs.	
PEOU	PEOU1	The features of blockchain technology are clear and understandable.	Esfahbodi et al. (2022); Kumar Bhardwaj et al. (2021)
	PEOU2	Interacting with a blockchain-based loyalty program does not require a lot of mental effort.	
	PEOU3	Blockchain-based loyalty programs can be used more easily than conventional loyalty programs.	

Table 3.2: *Measurement scale for dependent variables*

Independent Variables	Item Code	Measurement Items	Literature Review
AI	AI1	I intend to use blockchain-based loyalty programs.	Esfahbodi et al. (2022); Kumar Bhardwaj et al. (2021)
	AI2	I prefer to use blockchain-based loyalty programs, compared to typical loyalty programs.	
	AI3	I'm more likely to use loyalty programs more and consistently if they are blockchain-based.	

3.2. Data collection and analysis

3.2.1. Survey design

To find answers to the hypothesis of this study, this survey was inspired by previous studies and has been adjusted to fit the hypotheses of this study as seen in Appendix 1. The survey was done in both English and Portuguese, and the primary data was acquired through an online survey, with the research object comprising current users and non-users of retail loyalty programs, to help better understand the influence strength of blockchain on customer participation and engagement, participating or not. Respondents' anonymity and data confidentiality were kept avoiding social desirability bias and, to ensure random samples, participants were chosen from various age groups and academic backgrounds.

Due to concerns related to misconception and lack of knowledge of blockchain technology, brief descriptions of blockchain technology were included in the online survey, including one for each core feature this study focuses on – transparency, decentralization, and immutability – to give respondents an idea and a certain knowledge background before going through questioning. In addition, a small 2-minute video related to the application of blockchain technology in loyalty programs was included – in English with Portuguese captions available – in the form of a YouTube hyperlink to provide further background for blockchain in the loyalty program context. According to Esfahbodi (2022), this "just-in-time, on-demand, bite-sized form of information delivery" appears to be a new natural way people learn, with short videos being capable of providing visualization and better capture the attention of audiences (Manasrah et al., 2021).

3.2.2. Statistical Methods

A total of 229 surveys were returned, with 83 being discarded due to incomplete responses, resulting in a total of 146 useable responses. After collecting enough responses, the Statistical Package for Social Sciences (SPSS) – IBM SPSS Statistics 29 was used to treat and analyze the gathered data to validate the measurement scale as well to test the research hypothesis.

To better understand the underlying dimensions of blockchain characteristics and the TAM model, an exploratory factor analysis (EFA) was initially conducted. EFA is a statistical technique used to uncover the structure of relationships between variables and respondents, allowing researchers to identify latent factors that explain the patterns of correlations within a set of observed variables (Maccallum & Austin, 2000). In this context, factors exert the most influence when located in the extremes of the loading range of -1 to 1, representing stronger

effects on the variables. While in this study, eigenvalue criterion was initially used to determine the final set of factors, the interpretability of the factors was used to determine the final set of factors. Although an item value equal to 0.4 is often used as a rule of thumb (Samuels, 2016), the most common cut off value to retain items amongst researchers is 0.5, typically considered ideal (Arifin, 2018). Conversely, measurement items that do not meet this 0.5 threshold in any factor will be excluded from further analysis. In case of a measurement item showing a significant loading on more than one factor, it will be assigned to the factor with the highest loading.

Following the identification of these factors, the reliability of the attributes within each dimension of blockchain characteristics and the TAM model were assessed using Cronbach's alpha coefficient, a widely accepted measure of internal consistency, with a value greater than 0.7 indicating that the attributes within a factor are consistently measuring the same underlying concept (Shkeer & Awang, 2019). This threshold is used as a rule of thumb to ensure that each dimension's scale is reliable and meets the standard for analysis inclusion, such as multiple regression in this case.

A multiple regression will then be conducted to test the research hypotheses. The purpose of this analysis is to determine whether there is a significant relationship between blockchain characteristics and the TAM model on the intention of using retail loyalty programs. One critical assumption of multiple regression is the absence of multicollinearity among the independent variables, as it can distort the estimation of regression coefficients leading to biased results. This phenomenon happens "when at least two highly correlated predictors are assessed simultaneously in a regression model", causing "unstable and biased standard errors leading to very unstable p-values for assessing the statistical significance of predictors, which could result in unrealistic and untenable interpretations" (P. Vatcheva & Lee, 2016). To assess the presence of multicollinearity, the Variance Inflation Factor (VIF) was employed to quantify how much variance of the estimated regression coefficients is inflated due to multicollinearity, with the rule of thumb being that if the VIF for a variable is at least lower than 5, it indicates low or no correlation with other independent variables in the model, allowing the regression to be performed without concerns of multicollinearity. If the VIF values for all independent variables are below this threshold, the multiple regression analysis can proceed, providing insights into the validity of the proposed hypotheses, and if not, adjustments must be done before proceeding with the regression analysis. Even so, rules of thumb should be cautiously interpreted and put into context of the effects of other factors that can influence "the stability of the specific regression coefficient estimate"(P. Vatcheva & Lee, 2016).

4. Analysis results

4.1. Descriptive analysis

Out of the final 146 observations, more than half of respondents affirmed they don't participate in any loyalty programs (60.3%), much less in any retail loyalty program (78.8%), with current users showing a low rate of usage or not using their programs at all (85%). When asked about their view and/or experience with loyalty programs, around 28.1% of respondents found them lacking or extremely lacking, 28.8% found them somewhat useful – with only 1.4% finding them extremely useful –, and the remaining majority (41.8%) were neutral about it, not finding loyalty programs useful or lacking. To explain this lack of interest, respondents were asked to clarify what prevented them from participating/using loyalty programs more, with the main reasons being related to finding rewards lacking in value, appeal or benefits (46.6%) and/or sharing the idea that loyalty programs are too similar between retail brands (30.8%), followed by feeling discouraged to participate due to rewards and loyalty point expiring quickly (22.6%) and requiring too much from customers to feel meaningful (21.2%). Among other reasons, respondents showed less concerns with topics related to unnecessarily complicated or time-consuming sign-up's (15.8%), complicated and/or confusing reward earning and redemption (13%), badly optimized loyalty programs (14.4%), limited reward usage freedom (13.7%), irrelevancy when compared to preferences and needs (13.7%), and even personal data usage and protection (18.5%).

Finally, when asked how familiar respondents were with blockchain technology the majority (69.9%) reported they weren't familiar at all with the technology, and most participants (around 93.8%) never used a blockchain-based service or product or weren't even aware of it, which goes along with the idea that customers are still doubtful and show little to no knowledge of blockchain (Esfahbodi et al., 2022), usually associating this technology exclusively with digital currencies, without grasping its broader uses despite growing interest and development.

Table 4.1: *Demographic profile*

Demographic profile			
Age (years)		*Regular use*	
18-25	11.0%	Never	70.1%
26-40	27.4%	Sometimes	13.9%

41-55	54.1%	About half the time	2.9%
56-70	7.5%	Most of the time	9.5%
Education		Always	3.6%
Less than high school	4.1%	*Loyalty programs view*	
High school graduate	45.9%	Extremely lacking	12.3%
Bachelor's degree	32.9%	Somewhat lacking	15.8%
Master's degree	11.0%	Neutral	41.8%
Doctorate degree	1.4%	Somewhat useful	28.8%
Other	4.1%	Extremely useful	1.4%
Prefer not to say	0.7%	*Blockchain familiarity*	
Loyalty program participation		Not familiar at all	69.9%
No	60.3%	Slightly familiar	24.0%
Yes	39.7%	Familiar	2.7%
Retail loyalty program participation		Very familiar	3.4%
No	78.8%	*Blockchain use*	
Yes	21.2%	No	39.0%
		Not aware	54.8%
		Yes	6.2%
n = 146			

Table 4.2: *Retail loyalty program participation obstacles*

Participation obstacles (nº of respondents)	
Signing up for the loyalty program is unnecessarily complicated or time-consuming	23
The process of earning and redeeming rewards can be complicated and confusing	19
Loyalty programs are badly optimized, creating frustration	21
Rewards are not seen as valuable, appealing or beneficial enough to justify participation/membership	68
It can take too long or require too much spending to earn meaningful rewards	31

Limited options for how and where rewards can be used makes the program less attractive	20
Rewards or points that expire quickly discourages participation	33
Programs do not adapt to changing customer needs or preferences, becoming irrelevant	20
Concerns about how personal data is used and protected	27
Too many similar loyalty programs between retail brands	45
n = 146	

When asked to evaluate the transparency attributes, respondents generally showed a positive attitude, though there were variations across specific statements. For instance, the mean score for blockchain transparency integrity and authenticity (TP1) was 4.71, indicating that respondents somewhat agreed that transparency in loyalty programs added perceived value to transactions. Similarly, respondents somewhat agreed that transparency can reduce data asymmetry between brands and customers (TP2) and lead to more accurate and fair loyalty programs (TP4), scoring 4.73 and 4.90 correspondingly, reflecting a general sentiment that transparency was appreciated but not universally embraced. However, the "Transparent systems provide clarity and reduction of uncertainty and misunderstandings" statement (TP3) had a slightly higher mean of 5.03, suggesting that participants leaned more towards agreement regarding this aspect of transparency. The highest transparency-related score was at 5.44, highlighting that respondents agree that blockchain's transparency can help them make better and more informed decisions (TP5), finding it particularly favorable.

When it comes to decentralization, participants expressed a consistent range of views that fell into the somewhat agree category. For example, respondents showed a mild positive perception towards the idea of decentralization improving flexibility and versatility of loyalty program transactions (DC1) with a mean score of 4.80. The feeling of customer empowerment (DC2), although somewhat agreed upon, was not totally grasped with a close value at 4.79 and the idea that decentralized loyalty programs can create cost-effective solutions (DC3) had a slightly lower mean of 4.69, still reflecting a positive outlook, although the idea that it can increase the quality and value of loyalty offerings may not be as perceived. There's also a somewhat agreeable sentiment toward the idea that blockchain's decentralization grants greater

control over loyalty offerings (DC5), continuing the general trend of a somewhat favorable view of decentralization, and a better sense of freedom of choice (DC4) with the latest presenting the highest mean value of 5.05, signifying that respondents were leaning toward agreement. This positive sentiment toward freedom of choice can be explained by the relation between customers finding rewards lacking in value, appeal or benefits, and the idea decentralization can broaden the pool of goods and services through a wider network of brands.

The immutability attribute also elicited generally positive reactions from respondents, with most means falling into the somewhat agree category. Respondents showed a bigger sense of confidence in the idea of better loyalty data control (IM1) and demonstrated a stronger agreement that blockchain's immutability can reduce fraud and manipulation, enhancing security and trust in loyalty programs (IM5) – with mean values of 5.09 and 5.08 correspondingly. On the other hand, the idea that immutability can resolve pressured-based issues when using rewards (IM2) reflected a positive, although more reserved agreement, with a mean score of 4.89. Respondents also felt that immutability could somewhat increase data accuracy and quality (IM3) and loyalty program efficiency (IM4). This reflects a consistent perception that immutability is valuable with respondents giving more importance to data and security matters in retail, going against the related findings by Esfahbodi et al. (2022), in which data security wasn't really supported or perceived as particularly useful.

There's also a somewhat agreeable perception of blockchain's usefulness in retail loyalty programs, with respondents showing a generally positive attitude. Although somewhat agreed upon, the idea that blockchain can improve performance (PU2) fell behind with a mean value of 4.89, while respondents leaned more into the idea that this technology can create more effective (PU1) and overall useful (PU3) retail loyalty programs, with a slight inclination towards agreeing with the later. This aligns with the idea that the utility of blockchain in enhancing transparency and security is acknowledged, and respondents recognize clear benefits, but not fully embrace them across the board.

Respondents perceived blockchain's ease of use with less enthusiasm, leaning towards positivity but presenting smaller mean values. Mostly felt neutral when asked if blockchain features were clear and understandable (PEOU1), showcasing a similar related behavior towards the required mental effort to interact with a blockchain-based loyalty program (PEOU2), that although positive with a mean value of 4.48, its value falls to close to neutrality, suggesting that although respondents don't find this technology too mentally taxing, it still requires some effort with room for improvement. When comparing blockchain-based loyalty programs to conventional ones, there was a more obvious agreement the first could be used

more easily (PEOU3), showing a positive cautiousness towards it. These results imply that while respondents found the technology somewhat accessible, there may still be barriers to a seamless user experience.

Finally, adoption intention scores were similarly in the neutral to somewhat agree range, with slightly lower levels of agreement. When questioned about their intent to use blockchain-based loyalty programs (AI1), respondents showed neutrality towards the idea of adopting it, reflecting on the idea that people still have reservations as blockchain is still in an early stage of what its capable to do and offer as a recurrent day-to-day technology. However, when compared to conventional loyalty programs, respondents showed a slight preference for blockchain-based programs (AI2), even showing a somewhat positive sentiment towards the idea of using loyalty programs more consistently if they are blockchain-based (AI3), with the corresponding mean values of 4.57 and 4.55. All in all, this suggests that while users are open to blockchain technology, there are still hesitations or uncertainties in fully adopting it.

Overall, the data shows that while respondents are somewhat positive about blockchain's transparency, decentralization, and immutability, with the technology seen as both useful and secure, there remain some mixed perceptions regarding the ease of use and user intention. This could mean that while blockchain technology holds promise in enhancing loyalty programs, efforts to simplify its use and communicate its practical benefits more clearly could help drive wider adoption and stronger engagement from customers.

Table 4.3: *Descriptive analysis for each variable*

Blockchain-based loyalty programs	Items	Mean	Std. Dev.
Transparency	TP1	4,71	1,42
	TP2	4,73	1,40
	TP3	5,03	1,36
	TP4	4,90	1,46
	TP5	5,44	1,28
Decentralization	DC1	4,80	1,28
	DC2	4,79	1,28
	DC3	4,69	1,30
	DC4	5,05	1,28
	DC5	4,98	1,25

	IM1	5,09	1,22
	IM2	4,89	1,30
Immutability	IM3	4,98	1,22
	IM4	4,90	1,24
	IM5	5,08	1,27
	PU1	4,96	1,22
Perceived usefulness	PU2	4,89	1,25
	PU3	5,07	1,26
	PEOU1	4,38	1,35
Perceived ease of use	PEOU2	4,48	1,25
	PEOU3	4,65	1,27
	AI1	4,32	1,44
Adoption intention	AI2	4,57	1,37
	AI3	4,55	1,36

4.2. Exploratory Factor Analysis

Factor loading was employed using the Promax Rotation method, allowing for factors to be correlated and for a more complete analysis through the pattern matrix. 21 out of the 21 measurement items associated with the relation of blockchain's properties with TAM's perceived usefulness and perceived ease of use presented loading values above 0.5, existing no need to drop any. Proceeding to the factor analysis of the finalized 21 scale items, exploratory factor analysis (EFA) was employed using Maximum Likelihood and Varimax Rotation method, revealing that the 21 retained measurement items were condensed into 2 factors, with eigenvalues superior to 1.000, and a total variance of both factors equalling to approximately 64.42%. For sampling adequacy, the Kaiser-Meyer-Olkin (KMO) presented a "superb" value of 0.941 and Barlett's sphericity was significant (<0.001), showing a strong correlation between factors – and how they explain each other – and that the correlation matrix is not an identity matrix, meaning variables are also strongly related and ready to proceed with factor analysis (Ul Hadia et al., 2016).

Between the two created factors, the first one includes all measurement items related to blockchain's transparency (TP1-TP5), decentralization (DC1-DC5) and immutability (IM1-IM5), plus TAM's perceived usefulness (PU1-PU3). This can be understood as the reflection of blockchain's technological attributes and their perceived benefits in the context of retail

loyalty programs, linked by the idea these inherent proporties influence customer perceptions and experience, and are highly correlated with perceived usefulness, reflecting around 59.34% of the variance. On the other hand, the second factor included the remaining measument items pertaining to the perceived ease of use (PEOU1-PEOU3), which might reflect the usability and behavioral intention aspects of blockchain-based loyalty programs in retail, linked through the user's interaction with the system and how easily they can navigate and engage with the program, able to influence perceived uselfulness, user intention or both. This factor explains aproximately 6,03% of the variance.

Up next, a reliability analysis was conveyed to measure the internal reliability/consistency of the measurement items. Both factors presented an acceptable Cronbach's alpha value – bigger than the 0.7 benchmark –, with factor 1 loading a value of 0.967 and factor 2 loading a value equal to 0.896, meeting the reliability criteria and enforcing the idea that the items of each factor are related. This means factor 1 and factor 2 are both statistically appropriate and ready to proceed with data analysis.

Concluding this analysis, Factor 1 is defined as blockchain's usefulness on retail loyalty programs, represented by items TP1-TP5, DC1-DC5, IM1-IM5, and PU1-PU5, and implying that the user's perceived usefulness of blockchain's properties depend heavily on how they perceive the benefits as improving their experience with loyalty programs. Factor 2 will represent blockchain's ease of use, with the remaining attributes included – PEOU1-PEOU3 – suggesting that usability can act as a key driver of user adoption intention and engagement, and perceived usefulness in blockchain-based loyalty programs in retail. This result differs from the findings of (Esfahbodi et al., 2022) related to the influence of perceived ease-of-use on user intention, in which there was no influence or correlation between the two. For the dependent variable adoption intention (AI), the KMO overall value was 0.744, with a significant Bartlett's Test value of <0.001. All factors presented a eigenvalue above 1 and the numbers acquired in this analysis process concluded that the data is suitable for factor analysis.

Table 4.4: *Exploratory factor analysis (EFA) results*

Factors	Items	% variance	Factor Loading	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Factor 1	TP1	59.35%	0.644	0.966	0.967

	TP2		0.556	0.967	
	TP3		0.757	0.965	
	TP4		0.715	0.966	
	TP5		0.760	0.965	
	DC1		0.724	0.965	
	DC2		0.798	0.964	
	DC3		0.666	0.966	
	DC4		0.784	0.964	
	DC5		0.774	0.965	
	IM1		0.744	0.965	
	IM2		0.730	0.964	
	IM3		0.768	0.964	
	IM4		0.683	0.965	
	IM5		0.781	0.964	
	PU1		0.676	0.965	
	PU2		0.643	0.965	
	PU3		0.708	0.964	
	PEOU1		0.784	0.870	
Factor 2	PEOU2	6,03%	0.907	0.807	0.896
	PEOU3		0.747	0.878	

The exploratory factor analysis proves the existence of high correlation between the 3 blockchain properties – transparency, decentralization, and immutability – and perceived usefulness, acting as one construct in influencing the latter, while suggesting that perceived ease of use can have its influence in perceived usefulness and user intention. Although condensed into 2 factors, it shows that the original conceptual model can still be theoritically valid. To maintain theoretical rigor the original conceptual model will be kept, and each independent variable concerning blockchain's mentioned properties will be tested individually to understand the specific contribution of each variable, such is the original objective.

Following this, a reliability analysis was once again conducted, this time for each variable. All variables presented a coefficient alpha larger than 0.70, between 0.889 and 0.936, meeting the reliability criteria need to proceed to the regression analysis. The measurement items were then grouped into their respective variables – TP, DC, IM, PEOU, PU and UI.

Table 4.5: *Reliability analysis results*

Variables	Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
TP	TP1	0.663	0.880	0,889
	TP2	0.699	0.872	
	TP3	0.792	0.850	
	TP4	0.736	0.863	
	TP5	0.767	0.857	
DC	DC1	0.772	0.900	0,.916
	DC2	0.814	0.891	
	DC3	0.743	0.906	
	DC4	0.786	0.897	
	DC5	0.811	0.892	
IM	IM1	0.792	0.929	0.936
	IM2	0.857	0.917	
	IM3	0.865	0.915	
	IM4	0.803	0.927	
	IM5	0.834	0.921	
PU	PU1	0.861	0.890	0.928
	PU2	0.826	0.917	
	PU3	0.872	0.880	
PEOU	PEOU1	0.776	0.870	0.896
	PEOU2	0.849	0.807	
	PEOU3	0.764	0.878	
AI	AI1	0.816	0.948	0.936
	AI2	0.898	0.883	
	AI3	0.891	0.888	

4.3. Regression Analysis

For the final analysis of this study, a multiple linear regression was employed to study the impact of each blockchain property on the TAM model, divided into two assumptions: one with the variables TP, DC, IM, PEOU as predictors (constants) and PU acting as the dependent variable (mediator), and another with PU and PEOU acting as predictors and UI as a the dependent variable. The analysis included a check for multicollinearity, and all variables were found to have a VIF value below 5, indicating that there is no significant multicollinearity among the independent variables, allowing for the reliable inclusion of all variables in the regression model. It's noticeable that both assumptions passed the Durbin-Watson test with values between 1.5 and 2.5 – the first assumption presented a value of 2.143, while the second assumption presented a value of 1.997 – indicating there's no autocorrelation between observations/measurement items (Marshall et al., n.d).

The analysis revealed that 5 out of 6 hypothesis paths are significant, with a level of significance equal or lower than 0.001. The hypothesis concerning perceived usefulness (H1, sig < 0.001), perceived ease of use (H2 and H3, sig < 0.001), decentralization (H5, sig = 0.001) and immutability (H6, sig < 0.001) are all supported, playing a critical role on user intention of adopting blockchain techonology in retail loyalty programs.

Table 4.6: *Regression analysis results*

Hypothesis Test	Unstandardized coefficients Beta	Std. Error	t	VIF
H1: PU → AI	0.393	0.086	4.568	1.822
H2: PEOU → AI	0.502	0.085	5.885	1.822
H3: PEOU → PU	0.227	0.056	4.050	1.708
H4: TP → PU	-0.019	0.077	-0.244	3.122
H5: DC → PU	0.289	0.089	3.251	3.783
H6: IM → PU	0.485	0.093	5.224	4.202

The first hypothesis (H1) "The perceived usefulness of blockchain technology positively affects adoption intention of blockchain-based loyalty programs in retail" was supported by the multiple regression analysis, with a significant positive relationship found between perceived usefulness and user adoption intention (p = 0.393), indicating that users are more likely to adopt

blockchain-based loyalty programs when they perceive the technology as valuable and beneficial. Therefore, the first hypothesis is accepted.

The second hypothesis (H2) "The perceived ease of use of blockchain technology positively affects adoption intention of blockchain-based loyalty programs in retail.", was also tested and supported, showing a strong, significant impact (p = 0.502), suggesting that easy to use systems lead users to be more inclined to adopt and interact with blockchain-based loyalty programs in the retail context.

The third hypothesis (H3) "The perceived ease of use will positively affect users' perceptions of the usefulness of blockchain" was found to be valid, with the indication of a positive relationship between perceived ease of use and perceived usefulness (p = 0.227), indicating that simpler systems lead to useful programs. Hence, the third hypothesis is also accepted.

The fourth hypothesis (H4) "Blockchain's transparency positively contributes to customer use intention of loyalty programs" was the only hypothesis to not be supported by any data. The regression analysis showed a negative and non-significant effect of transparency on perceived usefulness (p = -0.19, sig = 0.808), implying that transparency does not directly drive customer adoption in this context, therefore being rejected.

The fifth hypothesis (H5) "Blockchain's decentralization positively contributes to customer use intention of loyalty programs", was found to be significant (p = 0.289), indicating that decentralization enhances customer's perceived usefulness and consequently user adoption by offering greater control and flexibility, thus being supported and accepted.

Finally, the sixth hypothesis (H6) "Blockchain's immutability positively contributes to customer use intention of loyalty programs", was tested and confirmed (p = 0.485). The results suggest that blockchain's immutability capability to secure and protect data plays a crucial role in encouraging customer engagement with loyalty programs in retail, being accepted as the final hypothesis.

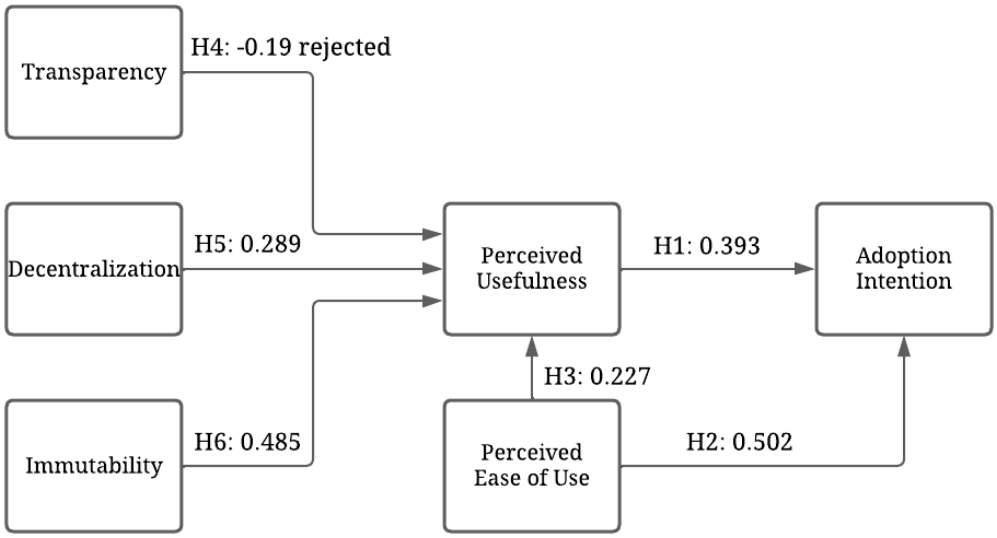

Figure 4.4.1: *Final conceptual model*

5. Discussions and implications

The findings of this study contribute both to the understanding of blockchain technology's impact of loyalty programs and offer pratical insights into how its attributes shape customer behavior. This study draws on the Technology Acceptance Model (TAM) to analyze user engagement with blockchain-based loyalty programs in retail. According to Davis (1989), the perceived usefulness and perceived ease of use of a technology play key roles in influencing users' adoption behaviors. By being applied to blockchain's integration into loyalty programs, the core features of this technology – transparency, decentralization, and immutability – can be assessed, creating insights into how customers perceive the value of blockchain technology in a retail loyalty program context.

5.1. Blockchains properties and perceived usefulness

The regression analysis results indicated that decentralization and immutability had statistically significant impact and positive effects on perceived usefulness. Specifically, immutability had largest positive effect on perceived usefulness, with a coefficient estimate equal to $p = 0.485$, indicating that among the 3 blockchain properties discussed, immutability contributes the most to the perceived usefulness of retail loyalty programs. Similarly, decentralization also had a significant positive impact with a coefficient estimate value of $p = 0.289$ showing, although with a smaller impact, that it also influences the perceived usefulness. On the other hand, transparency presented a insignificant coefficient of $p = -0.19$, suggesting that in this context, this blockchain property does not contribute to the perceived value of retail loyalty programs. When it comes to the perceived ease of use, it was found to also influence perceived usefulness significantly, with a coefficient value of $p = 0.227$, providing the idea that easier to use retail loyalty programs provide more useful value.

These results imply that among the factors contributing to perceived usefulness, immutability and decentralization are the most influential factors in how users assess the value and usefulness of blockchain-based loyalty programs in retail. Immutability in particular, implies that perceived usefulness is driven by ensuring data security and tampering prevention, as customers view the security and trustworthiness of blockchain's immutability as significantly valuable, emphasized by the idea of having better control over their loyalty data and feeling their rewards and personal data are protected from fraud or unauthorized changes. This suggests that blockchain's data integrity is a key driver of its perceived usefulness, which is inconsistent

with Esfahbodi et al. (2022) study, that insinuated there is no significant effect from data privacy security to perceived usefulness, due to blockchain's data protection being less believable. At the same time, decentralization might enhance the value of the retail program by giving users more freedom and control, due to the perception that customers are not dependent on a central authority to manage their data or redeem their loyalty rewards, making users feel more empowered and increasing the perceived utility of the system, by allowing to exchange and use rewards between different brands and user's. This suggests that by offering greater autonomy and flexibility in how customers interact with loyalty programs, decentralization can contribute to their perceived usefulness.

Perceived ease of use ends up playing a supporting role by implying that it can make the system feel more accessible, reinforcing the idea that usability (ease of use) and utility (usefulness) are linked, and suggesting that ease of use can directly affect how useful users perceive a loyalty system to be, by becoming more intuitive and easier to use. This goes hand in hand with other studies (Esfahbodi et al., 2022), affirming that the perceived ease of use will influence the perception of usefulness of the blockchain technology and highlight an indirect effect on the user intention via the mediating role of perceived usefulness. While blockchain's transparency usually enhances trust by allowing users to verify transactions and data, this result suggests that too much focus on transparency might not always translate into perceived value for users in this context. This finding may imply that while transparency is generally seen as a positive attribute in blockchain, it may not be a major factor driving perceived usefulness in loyalty programs, especially when transactions are linked to personal identities, making sensitive information vulnerable. In some cases, users might feel overwhelmed by too much information or might not find value in constantly checking or verifying every transaction detail. This suggests that while transparency is important for trust, overemphasizing transparency might detract from the perceived ease or simplicity of the program, potentially making it feel more complex or less user-friendly.

5.2. Perception and user intention

The results imply that perceived ease of use is the TAM model's most critical driver when it comes down to adopt blockchain-based loyalty programs in retail, with perceived usefulness also playing an important role as a mediating variable. The strong positive coefficient of perceived ease of use ($p = 0.502$) suggests that the ease with which users can navigate and interact with the blockchain-based loyalty program plays the most significant role in shaping

their intention to use it, going against the findings of (Esfahbodi et al., 2022; Kumar Bhardwaj et al., 2021). This means that the simpler and more intuitive the system is, the more likely customers are to adopt it. If the blockchain-based loyalty program is perceived as user-friendly and requires minimal mental effort to operate, it enhances the likelihood of users engaging with and using the program, as complicated or confusing systems will likely deter users, regardless of their potential benefits.

Perceived usefulness has also presented a positive impact ($p = 0.393$) on user intention indicating that users are more inclined to adopt blockchain-based loyalty programs in retail if they find it beneficial or valuable to their needs, reflecting the findings of Esfahbodi et al. (2022), who confirms the idea, in combination with other research, that users adoption intention grows positively when they perceive blockchain technology as useful in loyalty programs. By connecting this finding with the results previously discussed in the above section regarding blockchain's properties, it can be highlighted that the more prominent decentralization and immutability are in retail loyalty programs, the more they perceive the useful value and influence of blockchain, and the more they intend to use it in this context. If users perceive that using the blockchain system will improve their experience, simplify transactions and offer enhanced rewards, and protect their data, they are more likely to engage with the program, reflecting the fundamentals of the TAM model.

These results imply that the perceived ease of use is the most critical factor in driving the adoption of blockchain in the retail context of loyalty programs, but the perceived usefulness of the technology also plays an important role, insinuating that while users care about the benefits that blockchain provides, they are even more influenced by how easy the system should be to use, directly influencing its usefulness and simultaneously increasing both perceived usefulness and user intention.

5.3. Theoretical and practical implications

The theoretical contribution of this study lies in the empirical examination of the 3 key blockchain attributes in the retail context of customer use of blockchain-based loyalty programs, providing a theoretical perspective for the development and application of this technology. While much of the existing literature on blockchain adoption has centered on corporate users, particularly in the context of small to medium-sized enterprises and supply chain (Kumar Bhardwaj et al., 2021; Saberi et al., 2019), relatively little attention has been given to how individual customers perceive and interact with blockchain technology. By focusing on

individual users, the study can provide theoretical insights into how blockchain features influence user behavior and perception, while addressing the gap by examining how transparency, decentralization, and immutability affect the adoption intention of users.

This study also enhances the created and existing body of knowledge by integrating the TAM model (Davis, 1989) to assess its effect and influence on user adoption of blockchain-based loyalty programs, highlighting the role of perceived ease of use and perceived usefulness in shaping user engagement with blockchain technology. The findings reveal that attributes such as immutability and decentralization play a more prominent role in influencing consumers' perception of usefulness, while perceived ease of use has a bigger influence than previous studies have concluded (Esfahbodi et al., 2022; Kumar Bhardwaj et al., 2021). This research sheds light on how consumers value practical, technical features of blockchain, such as enhanced security and greater control over their rewards, rather than focusing on more subjective elements like data transparency. Consumers are more likely to engage with blockchain systems that offer tangible benefits – such as secure, tamper-proof transactions and decentralized control – while potentially overlooking aspects like transparency, which are less directly related to their experience of ease and utility.

Practically, the findings of this study offer valuable insights for retail brands aiming to take the next step in the loyalty programs context by incorporating new emerging technologies such as the case the studied blockchain technology, particularly regarding effective marketing strategies that can enhance consumer adoption and engagement. The results suggest that brands should emphasize specific blockchain attributes to increase the perceived usefulness and ease of use among consumers. One big takeaway is that immutability and decentralization are major factors influencing customers' perceptions of blockchain usefulness. For example, specifically emphasizing how blockchain can ensure a greater control over offerings and data and provide a better freedom of choice through a bigger range of products and points exchange, while reducing fraud and manipulation by ensuring secure and tamper-proof transactions could be central for marketing efforts.

Furthermore, companies should focus on providing a good user experience, as perceived ease of use is critical for encouraging adoption. Blockchain systems with user-friendly and easy to use navigation and engagement not only can help overcome potential adoption barriers, that may come with this relatively underexplored and underused technology, but also simultaneously increase the perceived usefulness and adoption intention of blockchain technology, existing as a direct and indirect propulsor of blockchain in the context of retail loyalty programs.

6. Conclusions

6.1. Main conclusion

This study seeks to deepen the understanding of how key features of blockchain technology influences its adoption in the retail market based on the TAM model. Among the attributes examined in this research, decentralization and immutability were found to have a positive relationship with the perceived usefulness of blockchain and consequently with user's intention to adopt and engage with blockchain-based loyalty programs, with no impact coming from transparency on an individual level.

While prior studies treated transparency as a distinct attribute perceived as useful (Esfahbodi et al., 2022; Zantalis et al., 2023), the current research found that it might interact more closely with other aspects of the blockchain environment, such as decentralization and immutability, and the perceived ease of use rather than working as a single influencer of the intention to adopt and use a blockchain-based loyalty program. The results suggests that customers may not view transparency as a standalone value, but rather in relation to how easily they can interact with the system, and how secure their data is, additionally indicating that today's customers place more emphasis on the practical benefits of blockchain technology, such as enhanced security and greater control over their shopping, rather than focusing solely on the transparency of the system. This shift in focus suggests that modern consumers, when engaging with blockchain-based loyalty programs, are increasingly concerned with how secure and flexible the technology is, and how fairly the rewards and benefits are distributed.

Finally, besides confirming the strong impact of the perceived usefulness on adoption intention, the model identifies the perceived ease of use not only as a stronger influencer but also as a mediator for the perceived usefulness, intensifying its impact and directly and indirectly influencing user adoption. This dual role of perceived ease of use suggests that when users find blockchain-based loyalty programs easier to adopt, they are more likely to perceive the technology as valuable, which in turn increases their likelihood of adopting it. By creating an easy-to-use user experience, companies can both enhance the perceived utility of the technology and create a more seamless path toward adoption, thus reinforcing the critical role of ease of use in the overall acceptance of blockchain technology in the retail context.

6.2. Present limitations and future research

The present research had some limitations. Firstly, due to missing answers, the original 229 respondents had to be cut down to 146, and although above the agreed minimum sample size of 100, it is not ideal. From this sample, and through the descriptive analysis, most respondents were unaware or didn't know anything about blockchain, leading to possible biased and limited responses due to lack of knowledge of blockchain as a technology and what it can do in the retail loyalty program context. The fact is that experiencing this technology and the level of knowledge regarding it, can chance the perspective of blockchain as a day-to-day technology and consequently impact answers. This can also be explained by the idea that, referred throughout this research, blockchain is still relative recent and undeveloped as a technology, leading to brands and consumers showing some skepticism towards its use and implementation. Future research is not only encouraged to verify this research findings using data from additional samples and to conduct comparative studies involving samples with some knowledge of blockchain, but to also further develop this technology towards its regular implementation as an everyday technology.

This study focused only on 3 blockchain features – transparency, decentralization, and immutability – measured specifically by the TAM model. Future research may adopt different models, such as the Diffusion of Innovation (DOI) and the Motivational (MM) models (Taherdoost, 2018), and expand on more and different blockchain characteristics and features, such as encryption and tokenization, aiming to create and share a more comprehensive insight into the vast blockchain network and how it can further impact blockchain adoption in loyalty programs .

Lastly, this research focusses solely on the intention of individual users, specifically retail customers, to adopt blockchain technology. The reality is that there are other parties influenced by this adoption, such as organizations, and thus future research may focus on researching the impact of the adoption of this technology on loyalty programs through brand lenses, aiming to find an equilibrium between organizational and customer needs when adopting blockchain-based loyalty programs in retail. Furthermore, this technology isn't loyalty program or retail exclusive, and it should be further applied and analyzed together with other fields, such as smart cities, banking, and data security, and emergent technologies, such as artificial intelligence (AI), Internet of Things (IoT), and machine learning (ML), further exploring the combination effect of these new technologies.

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Annexes

Annex A – Blockchain-based loyalty programs survey

Q1 Hello! My name is Diogo, and I'm a second-year student of ISCTE Business School Marketing Masters. As part of my thesis research, I ask you to answer this survey to help me understand how **blockchain-based loyalty programs can increase the use of loyalty programs in the retail sector**. Some definitions will be given throughout the survey so please read everything, it's important for a better understanding of the topic.

Some considerations:

1. This survey will take around 5-10 minutes;
2. Fully anonymous and all data is kept strictly confidential and used for academic purposes exclusively;
3. Please read carefully and answer honestly, there are no wrong answers. Thank you for your cooperation and for taking the time to participate in this survey.

Diogo Cerqueira -- dacca@iscte-iul.pt

Q1 Olá! O meu nome é Diogo e sou aluno do segundo ano do Mestrado em Marketing da ISCTE Business School. Como parte da minha investigação de tese, peço que responda a este inquérito para me ajudar a perceber como os **programas de fidelização baseados em blockchain podem aumentar a utilização dos mesmos no sector retalhista**. Algumas definições serão dadas ao longo do inquérito, por isso leia tudo, é importante para uma melhor compreensão do tema.

Algumas considerações:

1. Este questionário levará cerca de 5 a 10 minutos;
2. Totalmente anónimo e todos os dados são mantidos estritamente confidenciais e utilizados exclusivamente para fins académicos;
3. Por favor, leia com atenção e responda honestamente, não há respostas erradas. Agradeço a sua colaboração e disponibilidade para participar neste inquérito.

Diogo Cerqueira -- dacca@iscte-iul.pt

Q2 What is your age?

- ○ Under 18
- ○ 18 - 25
- ○ 26 - 40
- ○ 41 - 55
- ○ 56 - 70
- ○ Above 70

Q2 Qual é a sua idade?

- ○ Abaixo de 18
- ○ 18 a 25
- ○ 26 a 40
- ○ 41 a 55
- ○ 56 a 70
- ○ Acima de 70

Q3 What is your educational background?

- ○ Less than high school
- ○ High school graduate
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctorate degree
- ○ Other
- ○ Prefer not to say

Q3 Qual é o seu grau académico?

- ○ Abaixo de Ensino Secundário
- ○ Ensino Secundário
- ○ Licenciatura
- ○ Mestrado
- ○ Doutoramento
- ○ Outro
- ○ Prefiro não dizer

Q4 Are you currently participating in any loyalty program?

- ○ No
- ○ Yes

Q4 De momento participa em algum programa de fidelização?

- ○ Não
- ○ Sim

Q5 Are you currently participating in any **retail** loyalty program?

- ○ No
- ○ Yes

Q5 De momento participa em algum programa de fidelização retalhista?

- ○ Não
- ○ Sim

Q6 If yes, how regularly do you use it?

- ○ Never
- ○ Sometimes
- ○ About half the time
- ○ Most of the time
- ○ Always

Q6 Se sim, usa-o com que regularidade?

- ○ Nunca
- ○ Às vezes
- ○ Metade das vezes
- ○ Maioria das vezes
- ○ Sempre

Q7 What's your view of/experience with loyalty programs?

- ○ Extremely lacking
- ○ Somewhat lacking
- ○ Neutral
- ○ Somewhat useful
- ○ Extremely useful

Q7 Qual é a sua perspetiva/experiência com programas de fidelização?

- ○ Extremamente irrelevante
- ○ De certa forma irrelevante
- ○ Neutro
- ○ De alguma forma útil
- ○ Extremamente útil

Q8 What prevents you from participating/using loyalty programs more?

- ☐ Signing up for the loyalty program is unnecessarily complicated or time-consuming.
- ☐ The process of earning and redeeming rewards can be complicated and confusing.
- ☐ Loyalty programs are badly optimized, creating frustration.
- ☐ Rewards are not seen as valuable, appealing or beneficial enough to justify participation/membership.
- ☐ It can take too long or require too much spending to earn meaningful rewards.
- ☐ Limited options for how and where rewards can be used makes the program less attractive.
- ☐ Rewards or points that expire quickly discourages participation.
- ☐ Programs do not adapt to changing customer needs or preferences, becoming irrelevant.
- ☐ Concerns about how personal data is used and protected.
- ☐ Too many similar loyalty programs between retail brands.

Q8 O que impede de participar/usar programas de fidelização?

- [ ] A inscrição no programa de fidelização é desnecessariamente complicada ou demorosa.
- [ ] O processo de obtenção e aquisição de prémios pode ser complicado e confuso.
- [ ] Os programas de fidelização são mal optimizados, o que cria frustração.
- [ ] As recompensas não são consideradas suficientemente valiosas, apelativas ou benéficas para justificar a participação/adesão.
- [ ] Pode demorar demasiado tempo ou exigir demasiados gastos para ganhar prémios significativos.
- [ ] As limitações de como e onde os prémios podem ser utilizados tornam o programa menos atrativo.
- [ ] Os prémios ou pontos que expiram rapidamente desencorajam a participação.
- [ ] Os programas não se adaptam à evolução das necessidades ou preferências dos clientes, tornando-se irrelevantes.
- [ ] Preocupações sobre a forma como os dados pessoais são utilizados e protegidos.
- [ ] Demasiados programas de fidelização semelhantes entre marcas.

Q9 How familiar are you with blockchain technology?

- ○ Not familiar at all
- ○ Slightly familiar
- ○ Familiar
- ○ Very familiar

Q9 Qual é o seu grau de familiaridade com a tecnologia blockchain?

- ○ Nada familiar
- ○ Um pouco familiar
- ○ Familiar
- ○ Muito familiar

Q10 Have you ever used a service or product that uses blockchain technology?

- ○ No
- ○ Not aware
- ○ Yes

Q10 Já utilizou algum serviço ou produto que utiliza tecnologia blockchain?

- ○ Não
- ○ Não tenho conhecimento
- ○ Sim

Q11 Blockchain technology is a decentralized digital system capable of creating reliable and tamper-proof loyalty programs in which customers can interact and trade with each other, have a bigger flow of goods and services, and gain rewards such as loyalty points and cryptocurrency for every purchase made, allowing for better and more efficient experiences.

This survey focuses on Blockchain's core attributes - **transparency**, **decentralization**, and **immutability** - and how they can influence **loyalty program use**. Each attribute will have a short explanation.

For a better understanding, I recommend watching this **short video explaining the basic benefits of blockchain introduction in loyalty programs** (https://youtu.be/132qOxnyjSI).

Q11 A tecnologia Blockchain é um sistema digital descentralizado capaz de criar programas de fidelização fiáveis e invioláveis, nos quais os clientes podem interagir e negociar uns com os outros, ter um maior fluxo de bens e serviços e ganhar recompensas como pontos de fidelização e criptomoedas por cada compra efectuada, permitindo experiências melhores e mais eficientes.

Esta pesquisa foca-se nos principais atributos do Blockchain - **transparência**, **descentralização** e **imutabilidade** - e como podem influenciar o uso do programa de fidelidade. Cada atributo terá uma breve explicação.

Para uma melhor compreensão, recomendo assistir a este **pequeno vídeo que explica os benefícios básicos da introdução do blockchain em programas de fidelidade** (ligue as legendas) (https://youtu.be/132qOxnyjSI).

Q14 **Transparency** refers to the visibility of all transactions recorded on a blockchain ledger, untampered and accessible to all network participants, in which customers can verify rewards, and track tokens and transactions accurately and in real-time, including every step of the supply chain process.

Q14 **Transparência** refere-se à visibilidade de todas as transacções registadas num sistema blockchain, não adulterado e acessível a todos os participantes na rede, em que os clientes podem verificar as recompensas e acompanhar tokens e transacções com precisão e em tempo real, incluindo todas as etapas do processo da cadeia de abastecimento.

Q15 Based on your experience and perception, evaluate how much you agree with the below statements about blockchain's **transparency** influence in retail loyalty programs (1: strongly disagree - 7: strongly agree)

I feel...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Transparent loyalty programs show integrity and authenticity, adding perceived value to transactions.	○	○	○	○	○	○	○
Transparency reduces data asymmetry between brand and customer.	○	○	○	○	○	○	○
Transparent systems provide clarity and reduce uncertainty and misunderstandings.	○	○	○	○	○	○	○
Transparent loyalty programs are more accurate and fair.	○	○	○	○	○	○	○
Transparency helps me make better and more informed decisions.	○	○	○	○	○	○	○

Q15 Com base na experiência e perceção, avalie até que ponto concorda com as seguintes afirmações sobre a influência da **transparência** do blockchain nos programas de fidelização de retalho (1: discordo totalmente - 7: concordo totalmente)
Sinto que...

	Discordo Totalmente	Discordo	Discordo de alguma forma	Não concordo nem discordo	Concordo de alguma forma	Concordo	Concordo Totalmente
Programas de fidelização transparentes demonstram integridade e autenticidade, acrescentando o valor percetível às transacções.	○	○	○	○	○	○	○
A transparência reduz a assimetria de dados retidos entre a marca e o cliente.	○	○	○	○	○	○	○
Os sistemas transparentes proporcionam clareza e reduzem a incerteza e os mal-entendidos.	○	○	○	○	○	○	○
Os programas de fidelização transparentes são mais exatos e justos.	○	○	○	○	○	○	○
Transparência ajuda-me a tomar decisões melhores e mais informadas.	○	○	○	○	○	○	○

Q16 **Decentralization** enables peer-to-peer (P2P) transactions without needing a third party to validate them. Brands can directly and instantly credit acquired points in real-time and create "multi-vendor" programs where multiple entities collaborate in the name of expansion and range of goods and services, while customers can exchange rewards (i.e. loyalty points, tokens, NFTs) and data between each other.

Q16 **Descentralização** permite transacções entre pares sem necessidade de terceiros para validar as mesmas. As marcas podem creditar direta e instantaneamente os pontos adquiridos em tempo real e criar programas "multi-vendedor" em que várias entidades colaboram em nome da expansão e da gama de bens e serviços, enquanto os clientes podem trocar recompensas (ou seja, pontos de fidelidade, tokens, NFTs, etc.) e dados entre si.

Q17 Based on your experience and perception, evaluate how much you agree with the below statements about blockchain's **decentralization** influence in retail loyalty programs (1: strongly disagree - 7: strongly agree)
I feel...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Decentralized loyalty programs improve the flexibility and versatility of loyalty program transactions.	○	○	○	○	○	○	○
Blockchain's decentralization empowers me as a customer.	○	○	○	○	○	○	○
Decentralization creates cost-effective solutions, increasing the quality and value of loyalty offerings.	○	○	○	○	○	○	○
By expanding the range of offerings, decentralization gives a better sense of freedom of choice.	○	○	○	○	○	○	○
Decentralization grants customers greater control over offerings.	○	○	○	○	○	○	○

Q17 Com base na experiência e perceção, avalie até que ponto concorda com as seguintes afirmações sobre a influência da **descentralização** do blockchain nos programas de

fidelização de retalho (1: discordo totalmente - 7: concordo totalmente)
Sinto que...

	Discordo totalmente	Discordo	Discordo de alguma forma	Nem concordo nem discordo	Concordo de alguma forma	Concordo	Concordo totalmente
Os programas de fidelização descentralizados melhoram a flexibilidade e a versatilidade das transacções do programa de fidelização.	○	○	○	○	○	○	○
A descentralização da Blockchain dá-me poder enquanto cliente.	○	○	○	○	○	○	○
A descentralização cria soluções custo-eficazes, aumentando a qualidade e o valor das ofertas de fidelização.	○	○	○	○	○	○	○
Ao aumentar o leque de ofertas, a descentralização dá uma melhor sensação de liberdade de escolha.	○	○	○	○	○	○	○
A descentralização confere aos clientes um maior controlo sobre as ofertas.	○	○	○	○	○	○	○

Q19 **Immutability** provides a highly secure and accessible system, creating a database impossible to tamper with, preventing rewards from expiring, and allowing customers to retain control over personal data and dictate who can access it. Its P2P nature reduces the ability of third parties to collect private information, allowing users to personalize their experience without needing to give up personal data.

Q19 **Imutabilidade** fornece um sistema altamente seguro e acessível, criando uma base de dados impossível de adulterar, impedindo que as recompensas expirem e permitindo que os clientes mantenham o controlo sobre os dados pessoais e ditem quem pode aceder aos mesmos. A sua natureza de interação entre pares reduz a capacidade de terceiros recolherem informações privadas, permitindo que os utilizadores personalizem a suas experiências sem terem de fornecer dados pessoais.

Q20 Based on your experience and perception, evaluate how much you agree with the below statements about blockchain's **immutability** influence in retail loyalty programs (1: strongly disagree - 7: strongly agree)

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Blockchain's immutability gives me better control of my loyalty program data.	○	○	○	○	○	○	○
Immutability resolves pressure-related problems (such as pressure to use rewards), making the program more versatile and adaptable.	○	○	○	○	○	○	○
Immutability allows for more accurate and high-quality data, increasing my confidence in the loyalty program.	○	○	○	○	○	○	○
Through blockchain's immutability, customized experiences can create better and more efficient programs designs.	○	○	○	○	○	○	○

Blockchain's immutability can reduce fraud and manipulation, increasing security and trust in loyalty programs.	○	○	○	○	○	○	○

Q20 Com base na experiência e perceção, avalie até que ponto concorda com as seguintes afirmações sobre a influência da **imutabilidade** do blockchain nos programas de fidelização de retalho (1: discordo totalmente - 7: concordo totalmente)
Sinto que...

	Discordo totalmente	Discordo	DIscordo de alguma forma	Nem concordo nem discordo	Concordo de alguma forma	Concordo	Concordo totalmente
A imutabilidade do blockchain dá-me um melhor controlo dos dados no meu programa de fidelização.	○	○	○	○	○	○	○
A imutabilidade resolve problemas relacionados com pressão (como pressão para utilizar recompensas), tornando o programa mais versátil e adaptável.	○	○	○	○	○	○	○
Imutabilidade permite obter dados mais exactos e de alta qualidade, aumentando a minha confiança no programa de fidelização.	○	○	○	○	○	○	○
Através da imutabilidade do blockchain, as experiências personalizadas podem criar designs melhores e mais eficientes.	○	○	○	○	○	○	○

A imutabilidade do blockchain pode reduzir fraude e manipulação, aumentando segurança e confiança nos programas de fidelização.	○	○	○	○	○	○	○

Q21 Based on your experience and perception, evaluate how much you agree with the below statements about blockchain's **perceived usefulness** in retail loyalty programs (1: strongly disagree - 7: strongly agree)

I feel...

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Blockchain technology improves the effectiveness of loyalty programs.	○	○	○	○	○	○	○
Blockchain technology improves the performance of loyalty programs.	○	○	○	○	○	○	○
Blockchain technology can be useful in loyalty programs.	○	○	○	○	○	○	○

Q21 Com base na experiência e perceção, avalie até que ponto concorda com as seguintes afirmações sobre a **utilidade** do blockchain nos programas de fidelização de retalho (1: discordo totalmente - 7: concordo totalmente)

Sinto que...

	Discordo totalmente	Discordo	Discordo de alguma forma	Nem concordo nem discordo	Concordo de alguma forma	Concordo	Concordo totalmente
A tecnologia blockchain melhora a eficácia dos programas de fidelização.	○	○	○	○	○	○	○
A tecnologia blockchain melhora o desempenho dos programas de fidelização.	○	○	○	○	○	○	○
A tecnologia blockchain pode ser útil em programas de fidelização.	○	○	○	○	○	○	○

Q22 Based on your experience and perception, evaluate how much you agree with the below statements about blockchain's **perceived ease of use** in retail loyalty programs (1: strongly disagree - 7: strongly agree)

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
The features of blockchain technology are clear and understandable.	○	○	○	○	○	○	○
Interacting with a blockchain-based loyalty program does not require a lot of mental effort.	○	○	○	○	○	○	○
Blockchain-based loyalty programs can be used more easily than conventional loyalty programs.	○	○	○	○	○	○	○

Q22 Com base na experiência e perceção, avalie até que ponto concorda com as seguintes afirmações sobre a **facilidade de utilização** do blockchain em programas de fidelização de retalho (1: discordo totalmente - 7: concordo totalmente)
Sinto que...

	Discordo totalmente	Discordo	Discordo de alguma forma	Nem concordo nem discordo	Concordo de alguma forma	Concordo	Concordo totalmente
As características da tecnologia blockchain são claras e compreensíveis.	○	○	○	○	○	○	○
A interação com programas de fidelização baseados em blockchain não exige muito esforço mental.	○	○	○	○	○	○	○
Os programas de fidelização baseados em blockchain podem ser utilizados mais facilmente do que os programas de fidelização convencionais.	○	○	○	○	○	○	○

Q23 Finally, evaluate the statements below regarding the **likelihood** of the following (1: strongly disagree - 7: strongly agree)

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I intend to use blockchain-based loyalty programs.	○	○	○	○	○	○	○
I prefer to use blockchain-based loyalty programs, compared to typical loyalty programs.	○	○	○	○	○	○	○
I'm more likely to use loyalty programs more and consistently, if they are blockchain-based.	○	○	○	○	○	○	○

Q23 Por último, avalie as afirmações abaixo relativamente à **probabilidade de ocorrência** dos seguintes factos (1: discordo totalmente - 7: concordo totalmente)

	Discordo totalmente	Discordo	Discordo de alguma forma	Nem concordo nem discordo	Concordo de alguma forma	Concordo	Concordo totalmente
Tenciono utilizar programas de fidelização baseados em blockchain	○	○	○	○	○	○	○
Prefiro usar programas de fidelidade baseados em blockchain, em comparação a programas de fidelidade típicos.	○	○	○	○	○	○	○
É mais provável que eu utilize mais e de forma mais consistente os programas de fidelização se estes forem baseados em blockchain.	○	○	○	○	○	○	○