LUISS

Department of Law

Master of Science in Law, Digital Innovation and Sustainability

Course of Finance and Financial Technologies

Trust.io: can a Start-up based on Blockchain help to solve the information asymmetry in C2C markets?

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Academic year 2022/2023

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1. Introduction

Digital commerce represents an increasingly significant slice of the global economy, with steady growth over the last two decades, corresponding to the rise of the Internet. Since the beginning, in a mirror-image fashion to the physical market, different types of e-commerce have developed, from the more classic B2C to B2B (Ex: Alibaba) to C2C (Ex:Subito.it). However, the buying and selling of digital goods between private individuals, known as the C2C marketplace, still presents some challenges related to information asymmetry. Information asymmetry occurs when one party, involved in the transaction, has access to important information that the other party does not. In a C2C market, this can lead to problems of fraud, lack of trust between market participants and difficulties in fair transactions. As the Nobel prize winner George Akerlof pointed out in his famous article 'The Market for Lemons'[1] , information asymmetry can cause a 'bad market quality', in which more informed participants have an unfair advantage over less informed ones.

In this context, with the writing of Bitcoin's Whitepaper (Bitcoin: A Peer-to-Peer Electronic Cash System) in 2008, the white paper outlined the concept of a decentralized digital currency that would be based on a peer-to-peer network and secured by cryptography. Blockchain can be used to create an immutable record of transactions that occur between two or more parties. In this way, transactions can be made transparent and reliable, eliminating the possibility of fraud, and increasing trust between market participants. It can enable the removal of barriers to entry and the creation of a fairer and more transparent market. Blockchain is a digital ledger technology that enables the creation of a decentralized, secure, and transparent record of transactions[2]. It is a chain of blocks, where each block contains a unique code called a "hash" that is linked to the previous block, creating an immutable and tamper-proof chain of data. This technology is used to record and track various types of digital transactions, including cryptocurrency transactions, smart contracts(a self-executing contract with the terms of the agreement between parties being directly written into lines of code, distributed on a decentralized blockchain network), etc. Blockchain technology has gained substantial recognition in this sector of the economy, primarily due to its inherent characteristics. Such features enable the facilitation and management of digital transactions with a high level of security and transparency.

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[1] George Akerlof. "The Market for Lemons: Quality Uncertainty and the Market Mechanism." Quarterly Journal of Economics 84, no. 3 (1970): 488-500.

[2] "Part 1 What is a supply chain, value chain, and block chain?..." n.d., https://www.cliffsnotes.com/tutors-problems/Management/50296120--Part-1-What-is-a-supply-chain-value-chain-and-block-chain/.

In an attempt to remedy the aforementioned problems, the creation of a start-up company, *Trust.io*, is proposed, to solve the problem of fraudulent online buying and selling of event and transport tickets between individuals, through a secure and transparent digital platform. Directly through the app, users will be able to buy, exchange and store tickets in the cloud, with the possibility of reselling them until a few hours before the event or departure. The startup also envisages the creation of a token as an exchange currency for transactions carried out within the platform itself, enabling users involved in the transaction to also receive incentives to participate. Trust.io aims to eliminate the information asymmetry barriers in the buying and selling of digital goods between private individuals using blockchain technology to ensure transparency and reliability of transactions.

The incentivization of users to use the platform occurs through the distribution of small percentages of tokens each time a transaction is made. The scientific rationale behind this type of remuneration is provided by the theory of Nudge, as an individual, if incentivized, even with small insignificant amounts, is more likely to use the platform. Nudge theory, or gentle nudge theory, is a behavioral theory that suggests that individuals can be nudged towards certain behaviors in a non-coercive way using positive incentives. This theory suggests that small incentives can have a significant impact on people's behavior.[3] The fair distribution of small amounts of tokens may push users to use the platform more frequently or more intensively, even if the number of tokens is relatively insignificant. This phenomenon occurs because positive incentives may push people to consider using the platform as a more attractive option than other alternatives.

The aforementioned behavioral psychology model applied in the world of blockchain and tokens is called Tokenomics, i.e., a business model that uses cryptocurrencies or tokens as a form of value to incentivize user participation in a platform. The structure of a cryptocurrency's economy determines the incentives that encourage investors to buy and hold a specific coin or token.[4] Tokenomics define two aspects of a crypto economy: the incentives that determine how a token is distributed and the utility of the tokens, which influences their demand. Price is heavily influenced by supply and demand, and projects with the appropriate incentives can rise

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[3] Richard H. Thaler and Cass R. Sunstein, Nudge: Improving Decisions about Health, Wealth, and Happiness (New Haven: Yale University Press, 2008), ISBN 978-0-14-311526-7, OCLC 791403664.
[4] "What Is Tokenomics and Why Is It Important? - CoinDesk" n.d., https://www.coindesk.com/learn/what-is-tokenomics-and-why-is-it-important/.

in value[5]. Tokenomics set up the economy of a crypto project by creating incentives for the holders of the token and perhaps most importantly defining the utility of the tokens which represents a major factor behind their demand[6]. Developers have many variables at their disposal to influence various facets of the Tokenomics of their project, these variables include Mining and staking. Historical blockchains like Bitcoin, and Ethereum 1.0 release cryptocurrency to incentivize miners for validating transactions. This process is called proof of work (PoW). Miners have to use their computing power to "mine" new blocks and add them to the blockchain. In proof-of-stake (PoS) blockchains (Ex: Algorand) that have implemented a staking model for validators, rewards go to those who have locked away a certain number of coins in a smart contract.

In the Trust.io platform, with each transaction, market participants would have the opportunity to earn small percentages of tokens, which can be staked in their wallet within the application. This would not only provide an incentive for participants to use the platform but also increase the value of the token itself, creating a positive feedback mechanism for the market. Seller reputation, generated by buyer feedback, is critical to fostering trust in online marketplaces.[7] Marketplaces or sellers may choose to compensate buyers for providing feedback. Signaling theory predicts that only sellers of high-quality products will reward buyers for truthful feedback, especially when a product lacks any feedback and when the seller is not established [8]. Studies and research have shown how blockchain technology can provide transparency and security in transactions, while the use of a token enables the application of the blockchain and provides an incentive to use it.[9,3]

The aim of this paper is to explore the problem of information asymmetry in the buying and selling of digital items between private individuals, i.e., in the C2C market. In particular, the focus will be on the use of blockchain technology to eliminate this asymmetry and ensure the transparency and reliability of transactions.

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[5] https://www.coindesk.com/learn/what-is-tokenomics-and-why-is-it-important/
[6] https://economictimes.indiatimes.com/markets/cryptocurrency/key-differences-between-utility-tokens-security-tokens/articleshow/96454446.cms?from=mdr
[7] "Buying reputation as a signal of quality: Evidence from an online ..." n.d., https://onlinelibrary.wiley.com/doi/10.1111/1756-2171.12346.
[8] Li, Lingfang (Ivy), Steven Tadelis, and Xiaolan Zhou. "Buying Reputation as a Signal of Quality: Evidence from an Online Marketplace." *The RAND Journal of Economics* 51, no. 4 (2020): 965–88. http://www.jstor.org/stable/45380744.
[9] Taherdoost, Hamed, and Mitra Madanchian. 2023. "Blockchain-Based E-Commerce: A Review on Applications and Challenges" *Electronics* 12, no. 8: 1889. https://doi.org/10.3390/electronics12081889

The problem of information asymmetry has been widely studied in economics and arises when one party to a transaction possesses more complete information than the other, resulting in a negotiating advantage. As economist Akerlof points out,[10] information asymmetry can cause several problems, including the disappearance of efficient transactions and higher prices for buyers. It can also lead to the emergence of a parasitic market where sellers of poor-quality digital items can prosper at the expense of buyers.

The approach that has been used in drafting the business model is to use the sustainable governance model approach, meaning pursuing a sustainable strategy that enables a company to create value for its shareholders, while contributing to a sustainable society. Governance models (i.e., organization and management) are used and based on the principles of sustainability, i.e., the achievement of long-term economic, social, and environmental balances. In practice, this means considering the impacts of decisions and actions over the long term, as well as financial and short-term results. In this way, it seeks to ensure that choices made today do not compromise the ability of future generations to meet their needs[11]. Within the scope of this thesis, impacts will include:

- Improved transparency: the adoption of sustainable practices can increase a company's transparency towards its customers, creating a climate of trust and transparency.
- Protection of personal data
- Improvement of reputation: Enhancing the company's reputation, both towards customers and stakeholders. This can increase the trust of customers and investors, creating a favourable environment for the company to grow.

The use of blockchain technology for buying and selling between private individuals represents an innovative solution to solve these problems, through its inherent characteristics of transparency of transactions and their reliability, ensuring that all users have access to the same information. Currently, private individuals selling these items often lack the ability to provide complete and reliable information on their authenticity and quality, which can lead to fraud and scams. Secondly, the start-up offers social utility in that it allows individuals to earn small percentages of tokens through transactions, which can be staked in the app's wallet. This not only incentivizes users to use the platform but also to save money and invest responsibly.

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[10]George Akerlof. "." Quarterly Journal of Economics 84, no. 3 (1970): 488-500.
[11] Unepfi, Integrated Governance – A new model of governance for sustainability (2014)
https://www.unepfi.org/fileadmin/documents/UNEPFI_IntegratedGovernance.pdf

As an academic study[12] points out, blockchain can enable the creation of a more efficient, secure, and scalable transaction system, which can increase trust between market participants and foster the development of new business models.

Furthermore, adopting the use of a token to carry out transactions would increase the security and speed of transactions. For this type of service, the most appropriate core technology to use is Algorand, as it possesses a high throughput, i.e., it allows for many transactions in a given period of time (e.g., Ethereum TFT (Transaction Finality Time, that is, the time it takes to confirm a transaction as unchangeable) 60 seconds, Algorand TFT 5 seconds) while offering a low transaction cost. Furthermore, it is considered more appropriate to adopt a Proof-of-Stake (PoS) mechanism to ensure greater decentralization and security, in addition to the fact that it allows Smart Contracts and Tokens to be created on this network. The creation of a token based on this technology can be used as an incentive for users to eliminate information asymmetry and create a fairer and more transparent C2C market, where users can buy and sell digital objects with greater security and confidence[13]. This start-up, therefore, represents an added value for society, as it helps to create a fairer and more transparent marketplace, which fosters economic growth and the development of digital commerce by preventing a user's items, unable to use them, from going unused.

In the C2C market, this problem manifests itself in the lack of trust between individuals in the purchase and sale of digital items, such as accounts, games, virtual characters, tickets, etc.

The research question that provided the input for the creation of this start-up is: How can blockchain technology be a vehicle for solving information asymmetry in the C2C market for digital objects? To answer this question, we will use a qualitative research methodology based on case analysis and a review of existing academic literature.

Throughout the analysis of real-life cases, an attempt will be made to understand how blockchain technology can be used to ensure transparency and trustworthiness of transactions, as well as to foster stakeholder participation. Furthermore, an attentive review of existing academic literature is carried out to identify aspects that need more attention, evidence, and analysis.

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[12] Kshetri, R. S. "The Economics of Cryptocurrency and Blockchain technology: A comprehensive review." Journal of Financial Perspectives 6, no. 3 (2018): 1-18.
[13] What does it means Throughput? https://coinmarketcap.com/alexandria/glossary/throughput

The objective of this thesis is to propose a technological solution that eliminates information asymmetry in the C2C market for digital items, with the added value of a multi-disciplinary approach touching on economic, governance, fintech, and legal aspects impacted.

In the following chapters, the various aspects of the proposed solution will be touched upon analysing scenarios, technology transfer, stakeholder engagement, and sustainable governance models. In addition, a business plan of the proposed solution will be presented, in which a detailed description of the platform, a cost-benefit analysis, and an assessment of potential challenges and limitations will be provided to demonstrate how it can be effectively implemented in practice.

2. Current state of the art

2.1 Where the problem stems from

Over the last decade, the digital economy has expanded rapidly, with a significant increase in commercial transactions conducted through the online channel, including those related to the buying and selling of digital goods between individuals, such as software, games, music, and films. This trend has highlighted a major issue[11], namely the information asymmetry between the parties involved in the transaction, which can result in a significant risk for the buyer and a loss of confidence in online transactions.

Information asymmetry in sales of digital products between individuals online is a common problem[14] that undermines the transparency and security of transactions. Often, sellers do not provide detailed information about the products they sell, such as their provenance, their state of preservation or the actual presence of viruses, etc. On the other hand, buyers may provide inaccurate or even false information on their profiles, e.g., by falsifying reviews, stealing other people's identities, or providing misleading feedback.

Moreover, even if the seller is trustworthy, it may be difficult to guarantee the security of the transaction and the protection of personal data. The use of online payment platforms may entail risks of fraud or theft of personal data, with potentially profound consequences for the buyer.

According to research by Statista, there were more than 2.14 billion digital transactions in the C2C market worldwide in 2021, with a forecast to reach 2.52 billion by 2024[15]. However, along with the growth in transactions, the risk of fraud is also increasing. According to a report by

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[14] Arbi, Khalil Ahmed & Kausar, Abdul & Salim, Imran. (2017). Minimizing Asymmetric Information in Online Markets through Knowledge Management. International Journal of Management Excellence. 8. 924. 10.17722/ijme.v8i2.310.

[15] https://www.statista.com/statistics/251666/number-of-digital-buyers-worldwide/

Visa and Wikefield[16] , 73% of the surveyed sample will fall into the traps of online fraud in 2023. It is clear that these problems and the possibility of being scammed represent a significant obstacle for the C2C market, limiting the potential of sales between individuals online and causing a loss of consumer confidence. However, the use of blockchain technology may be a promising solution to these problems.

Due to the current market settings, buyers may be less inclined to trade, as they cannot be sure of the reliability of sellers and the products they buy, while sellers' risk financial damage due to fraudulent transactions. Moreover, traditional online sales sites often do not provide effective tools to prevent the dissemination of false information or to protect the parties involved in the event of disputes.

To solve these problems, it may be necessary to introduce a system that guarantees the transparency and security of transactions between private individuals online. The use of blockchain technology could be a solution, as it allows the creation of immutable and secure records of transactions, guaranteeing the authenticity and integrity of data. The creation of a start-up that leverages this technology could have a significant impact on the market, improving the trust of buyers and sellers and stimulating the growth of digital commerce between private individuals.

2.2 Information asymmetry

Information asymmetry is a phenomenon present in many markets, where one party to the transaction has more information than the other[17]. This issue can cause fairness and efficiency problems in markets, as parties with more information can exploit parties with less information. Akerlof, Nobel Prize winner for economics in 2001[18] , describes how information asymmetry can lead to the emergence of" lemon" markets, in which producers of lower quality products can prosper at the expense of higher quality ones. There is evidence that this problem can significantly impact the functioning of markets and resource allocation[19]. Asymmetric information can manifest itself in the form of hidden characteristics of the good or service being

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[16] https://usa.visa.com/content/dam/VCOM/regional/na/us/run-your-business/documents/visa-fraudulese-report.pdf

[17] "Information Asymmetry Explained (With Examples) - 2023 - MasterClass" n.d., https://www.masterclass.com/articles/information-asymmetry-explained.

[18] George Akerlof. "The Market for Lemons: Quality Uncertainty and the Market Mechanism." Quarterly Journal of Economics 84, no. 3 (1970): 488-500.

[19] Joseph Stiglitz. 1985. "Asymmetric Information and Economic Theory." In Handbook of Microeconomics, vol. 2, edited by Kenneth J. Arrow and Michael D. Intriligator, 235-286.

transacted; in this case, the phenomenon of "adverse selection" is produced and it can have a significant impact on digitized markets, as technology offers new opportunities for information acquisition and management.

- Digitized markets can create information asymmetries due to limited access to data. For example, large technology platforms such as Google and Facebook have access to massive amounts of data on consumers, which they can use to customize offers and improve profits, by advertising and selling products through their platform. Facebook collects a lot of data about users, from e-mail address to phone battery power[20]. Meta's (Facebook) core business is not to sell data to third-party companies, but to sell user (companies) access, particularly access to the News Feed, and it uses this data to show you specific, third-party ads that it thinks you might like or click on[21], targeted ads Targeted advertising generates a lot of business for Meta. In 2022, the company reported advertising revenue of $113.42 billion, and the figure is set to grow (over the past 5 years, revenue has tripled)[22]. On the other hand, consumers may find it difficult to assess the quality of products and services offered, as they do not have access to complete and accurate information.

- The phenomenon of information asymmetries can be amplified by artificial intelligence and machine learning. For example, e-commerce platforms may use artificial intelligence to predict consumer desires and customize offers, but consumers may not be aware of how these predictions are made or their effects.

- Information asymmetry may be amplified by the limited transparency of automated decisions. For instance, automated credit assessment systems may use complex algorithms to assess the creditworthiness of applicants, but applicants may not be able to understand the reasons why their loan was denied.

To sum up, information asymmetry in digitised markets can lead to equity and efficiency problems but it can be controlled through regulation and information transparency.

Going into the specific scope of this research, information asymmetry can be a significant problem in transactions between private parties, as one party may have more information than the other.

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[20] How Facebook uses your data for ad targeting https://www.vox.com/2018/4/11/17177842/facebook-advertising-ads-explained-mark-zuckerberg

[21] https://www.statista.com/statistics/271258/facebooks-advertising-revenue-worldwide/

[22] Statista, S.Dixon,Meta: annual advertising revenue worldwide 2009-2022 (2023), Global Meta advertising revenue 2022 | Statista

In the first instance, information asymmetry may affect the quality of business decisions, as one party may use its information to unfair advantage. For example, a seller may hide defects in a product, or a buyer may underestimate the price of a good.

Secondly, information asymmetry may affect the fairness of transactions, as one party may benefit at the expense of the other. For example, a seller may sell a good at a higher price than would have been possible in a perfectly informed market.

As a last point, information asymmetry may affect the efficiency of transactions since a party may decide not to participate in a transaction due to uncertainty about the information. For example, a buyer may decide not to purchase a product due to lack of information about its functioning, condition, etc.

Information asymmetry can lead to misallocation of resources and increased transaction costs[23]. Blockchain technology, which is based on cryptography and peer-to-peer distribution, could be a solution to this problem. According to the authors[12], blockchain could make it possible to create a shared and secure register of transactions, thus eliminating information asymmetry between the parties involved in the transaction. Signal theory[12], suggests that one party can send a credible signal to the other to communicate valuable information. In the context of online transactions, the reputation of sellers and feedback from buyers can act as signals of trustworthiness.

This could offer greater assurance to users, enabling them to better assess purchase opportunities and reduce the risk of fraud. Since it records all transactions immutably, it is possible to trace the transaction history of a particular good or service, from its origin to its destination. This means that the parties involved in an online transaction can view and verify the entire exchange process, which can increase mutual trust and mitigate the possibility of fraud.

In addition, blockchain could make it possible to improve the quality of information available to stakeholders by creating a public and transparent transactions ledger, trust between the parties involved would be improved. This, in turn could lead to a reduction in transaction costs and an increase in overall economic efficiency.

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[23] Mavlanova, T., Benbunan-Fich, R., & Koufaris, M. (2013). Signaling theory and information asymmetry in online commerce. Journal of Business Research, 66(10), 1615-1620.

2.3 Moral hazard

Moral hazard is, under the definition of the economist D. Rowell and L.B. Connelly, the risk that a party has not entered a contract in good faith or has provided misleading information about its assets, liabilities, or credit capacity, and is a phenomenon that has been extensively studied in behavioural economics and finance[24]. This frequent problem presents itself in several situations where one of the parties involved does not have all the information necessary to make an informed decision. In the financial sphere, it occurs when an agent has the opportunity to profit from his actions, but the other party does not have sufficient information to assess the actual risk of the transaction. The tendency of an imperfectly controlled individual to engage in dishonest or otherwise undesirable behaviour.

According to the study published in the Financial Times[25] moral hazard can occur in various situations, such as in insurance contracts. In this case, the insured might not take the necessary precautions to avoid the risk, since the insurance covers him against the negative consequences. Furthermore, according to Roth and Ockenfels' research[26], moral hazard is a key factor in online transactions between private individuals, where trust between the parties is crucial.

Another important source concerning moral hazard is Holmström's study[27] , which introduced the concept of "moral hazard" in the contractual sphere, emphasizing the difficulty in monitoring an agent's action and assessing its actual contribution.

Moral hazard is a significant problem in several situations where the lack of transparent information and trust between parties makes it difficult to make informed decisions. However, by implementing control tools that make transactions transparent, it is possible to reduce the risk of misconduct and improve trust between the parties involved.

One way to counter moral hazard in these marketplaces could be the use of reputation systems or independent verification systems. For example, some online marketplaces, such as eBay, use

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[24] D. Rowell and L.B. Connelly, "A History of the Term 'Moral Hazard,'" Journal of Risk and Insurance 79, no. 4 (2012): 1051-1075.

[25] Beware moral hazard fundamentalists. ft.com/content/5ffd2606-69e8-11dc-a571-0000779fd2ac

[26] Ockenfels, Axel and Roth, Alvin. "Late and Multiple Bidding in Second Price Internet Auctions: Theory and Evidence Concerning Different Rules for Ending an Auction." Games and Economic Behavior 55 (2003): 297-320. doi: 10.1016/j.geb.2005.02.010.

[27] Holmström, Bengt. "Moral Hazard and Observability." The Bell Journal of Economics 10, no. 1 (1979): 74-91. https://doi.org/10.2307/3003320.

a user feedback system where sellers and buyers can rate each other and leave feedback on their transaction experience. This feedback system can help buyers assess the seller's reputation and can provide incentives for sellers to act honestly.

However, these reputation systems are not perfect and may be subject to manipulation by sellers or buyers; see the case of fake reviews[28]. Moreover, they are not available for all digital marketplaces and may not be sufficient to counter moral hazard in all cases, e.g., in informal marketplaces, i.e., those markets where transactions take place outside official and regulated channels, relying on informal or community-based reputation systems to establish trust between parties. They may be vulnerable to manipulation and fraud and may lack formal mechanisms to ensure the reliability and transparency of transactions. In these markets, individuals and businesses can rely on informal or community-based reputation systems to establish trust and reduce the moral hazard associated with anonymous or unregulated transactions[29].

The use of blockchain technology could be another solution to counter moral hazards in C2C digital item markets. Blockchain can provide an immutable record of all transactions made, which can be used to track transaction history and assess the reputation of sellers. Furthermore, blockchain technology can provide an independent verification system to ensure that the information provided by sellers on item quality is accurate and verifiable.

The paper 'The Effect of Reputation to the Moral Hazard in C2C E-Markets with Game Theory'[30] studies the impact of reputation on the management of moral hazard in peer-to-peer (C2C) e-commerce markets. The researchers used game theory to analyse how sellers can manage moral hazards with reputation.

The research result shows that the effect of reputation on moral hazard depends on the type of reputation, i.e., whether the reputation is based on the buyer's evaluation or on the seller's prior knowledge. Furthermore, reputation can influence the seller's choice of price, the buyer's behaviour, and the seller's decision to leave the market or not.

The authors[14] conclude that reputation can be an effective means to reduce moral hazard in C2C marketplaces and suggest that e-commerce platforms should encourage and reward sellers who build a good reputation.

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[28] He, Sherry and Hollenbeck, Brett and Proserpio, Davide, The Market for Fake Reviews (October 1, 2022). Marketing Science, 2022,Vol.41(5),p.896-921, Available at
SSRN: https://ssrn.com/abstract=3664992 or http://dx.doi.org/10.2139/ssrn.3664992
[29] Kollock, P. (1999). The production of trust in online markets. Advances in Group Processes, 16, 99-123.
[30] Mu, Fangjun. "The Effect of Reputation to the Moral Hazard in C2C E-Market with Game Theory." Journal of Convergence Information Technology 8, no. 7 (2013): 405-10.

The theory behind the research is game theory, with a particular focus on information asymmetry and agency problems. The authors of the paper[14] develop a model of agent behaviour in an electronic C2C market in which a moral seller has access to better information than the buyer.

Research results indicate that when sellers can build a positive reputation, buyers are willing to pay a premium to buy from them, applied practically, users will be willing to pay a higher price than the market average, if the user from whom they buy the item has many reviews (a concept comparable to being a verified seller) and that these are positive. Such a strategy can reduce moral hazard and improve social welfare. Furthermore, the model shows that a high reputation of the seller can lead to greater economic gain in the long term than a selfish behavioural choice in the short term.

2.4. C2C Market

2.4.1 C2C Digital market - Comparison between the traditional market and Blockchain

C2C marketplaces, i.e., marketplaces where individuals sell and buy goods and services directly from each other, are becoming increasingly popular worldwide thanks to the spread of digital technologies and the growing confidence of users to shop online.[31]

One of the advantages of C2C marketplaces is that they allow sellers to earn money by selling items they no longer need, while buyers can find good bargains at affordable prices, or allow them to buy items they no longer have within the B2C marketplace (Ex: Sold-out concert tickets). In addition, these marketplaces create an opportunity for people to do business without having to open a shop or a company (Ex: On the B2C selling platform Vinted, users set up real online 'shops' where they sell used goods).

However, there are also some challenges and problems associated with C2C marketplaces. One of the main problems is the lack of guarantees on products sold, which can lead to fraudulent and unsatisfactory transactions for buyers. Furthermore, the lack of reliable customer support can make it difficult to solve problems when they occur. In addition, C2C marketplaces can

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[31] Fmi, Customer-To-Customer (C2C) Community Marketing Software Market (2022) https://www.futuremarketinsights.com/reports/customer-to-customer-c2c-community-marketing-software-market

also create unfair competition with traditional retail shops, the greater availability of assortment, clearly displayed prices and often cheaper prices (due to lower running costs), can influence this situation[32]. For example, a study was done for the hotel sector which found that the sharing economy platform Airbnb had a significant impact on the hotel industry, generating less demand for hotel rooms and an increase in demand for short-term rentals by consumers[33] . On the other hand, the B2B market involves the sale of products and services between companies. Companies often use their websites as a means of direct sales, publishing information about their products and allowing customers to place orders online.

Among new technologies, blockchain could be the one that allows this type of market to solve its problems[34]. If we think of C2C markets, to date, they have received a great boost from the accentuated sensitivity that has developed in recent years for the environment[35], the sale between private individuals of used products, such as objects, clothing, etc., has increased greatly to ensure greater sustainability of the products and not end the life of the same at a single use. At the same time, the sale of digital items, given the spread of the web and social channels, is also experiencing a period of strong growth.[36] Despite this, there is still a certain mistrust on the part of the public, which, buying from a private individual, without guarantees, is not in a perfect information situation, and remains wary for fear of being cheated[37].

2.4.2 Informal market

In recent years, a fast-growing branch of C2C, to take one example, is the vintage market, just think that since 2020 there has been a 275% increase in sales in the vintage clothing sector alone. The second-hand vertical growth demonstrates a change in consumer perspectives and habits towards a more ethical and sustainable vision of fashion. 81% of second-hand shoppers

[32] https://www.oecd.org/daf/competition/implications-of-e-commerce-for-competition-policy-2018.pdf
[33] Zervas, Georgios, Proserpio, Davide, & Byers, John. (2016). The Rise of the Sharing Economy: Estimating the Impact of Airbnb on the Hotel Industry. Boston University School of Management Research Paper No. 2013-16. Retrieved from https://ssrn.com/abstract=2366898
[34] Chang, Y.-W., Lin, K.-P., & Shen, C.-Y. (2019). Blockchain Technology for e-Marketplace. In 2019 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops) (pp. 429-430). Kyoto, Japan: IEEE. doi: 10.1109/PERCOMW.2019.8730733.
[35] Borusiak, Barbara & Szymkowiak, Andrzej & Horska, Elena & Raszka, Natalia & Żelichowska, Elżbieta. (2020). Towards Building Sustainable Consumption: A Study of Second-Hand Buying Intentions. Sustainability. 12. 875. 10.3390/su12030875.
[36] Fmi, Customer-To-Customer (C2C) Community Marketing Software Market (2022) https://www.futuremarketinsights.com/reports/customer-to-customer-c2c-community-marketing-software-market
[37] Daroch, B., Nagrath, G. and Gupta, A. (2021), "A study on factors limiting online shopping behaviour of consumers", Rajagiri Management Journal, Vol. 15 No. 1, pp. 39-52. https://doi.org/10.1108/RAMJ-07-2020-0038

plan to spend the same amount or more over the next five years.[38] Informal markets in the sale of objects between private individuals are a subgroup of the C2C market. These markets are usually characterized by a lack of official regulation, such as flea markets or free classifieds websites, the most popular of which include Facebook Marketplace[39].

These unregulated markets present several advantages and challenges. On the one hand, the lack of sales taxes or commissions can make it more attractive to sell used or niche items at a lower price than the market price. Furthermore, sellers can avoid the complexity of online transactions and the need to provide guarantees on the product sold. On the other hand, informal marketplaces may also present some challenges, such as the lack of guarantees on product quality and the possibility of running into untrustworthy sellers or even fraudsters. Moreover, it might be difficult for buyers to find the desired product among a wide range of offers that are often incomplete with information, and the lack of official feedback may make it difficult to evaluate sellers and choose a quality product.

These marketplaces can represent an opportunity for sellers who wish to avoid the complexities of online transactions or who wish to sell niche products. However, buyers should be aware of the challenges associated with these marketplaces and take precautions to avoid frauds or low-quality products. Some literature studying this phenomenon has tried to examine what factors influence people's decision to sell on informal marketplaces. One study[40] showed that the availability of formal alternatives, such as online sales sites, is a key factor influencing the decision to sell on informal marketplaces. Moreover, sellers who have greater confidence in the value of their product tend to sell on informal marketplaces, as these marketplaces offer greater control over the price and negotiation of the transaction. However, informal markets in the sale of objects between individuals also present some challenges. Moreover, the risk of scams is high, as many sellers do not provide accurate product information or do not respect the terms of the transaction, leveraging the so-called moral hazard.

Informal markets in the sale of objects between private individuals present some opportunities for sellers wishing to sell used or niche products at a lower price than the market price. However, buyers should be aware of the challenges associated with these markets, such as the

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[38] BCG, The Consumers Behind Fashion's Growing Secondhand Market(2020)

[39] Agung Dermawan, A., Nasution, H., & Haikal Sitepu, M. (2020). The impact of branding on purchasing decision-making in mall shopping and online shopping. IOP conference series. Materials Science and Engineering, 801(1), 12146. https://doi.org/10.1088/1757-899X/801/1/012146

[40] Chen, Jengchung Victor, Bo-chiuan Su, and Andree E. Widjaja. "Facebook C2C Social Commerce: A Study of Online Impulse Buying." Journal of Electronic Commerce Research 18, no. 3 (2017): 266-280.

lack of guarantees on product quality and the possibility of running into untrustworthy sellers or scammers. The choice of a formal or informal market is made based on one's needs and knowledge of the risks and opportunities associated with each option.

2.4.3 Online digital market

Within the informal markets, in addition to the buying and selling of second-hand items, with the advent of digital, the phenomenon of reselling digital items, such as, for example, tickets for transport, tickets for events of various kinds, etc., has increased. By digital items, we mean all those dematerialized products, characterized by a unique code that can be exchanged digitally, without the need to ship or meet the counterpart. There could be some risks in using online platforms, to mitigate these risks, the platforms that host these exchanges between individuals have introduced several measures and features to provide more security for both buyers and sellers. Some of these measures are, for instance, the improvement of security systems by including reviews and ratings of sellers and buyers, so that users can create their own digital reputation and have a good buying and selling experience. [41]

2.5. Aggregator platforms

In the last few years, we have witnessed a rapid development and spread of web platforms aggregating offers from different companies, especially in sectors such as tourism, entertainment, and transport[42]. These platforms, also known as 'aggregators', offer numerous benefits to consumers and businesses, including greater price transparency, ease of access and the ability to quickly compare available options.

Offer aggregators are online platforms that collect and display prices and information on purchase options offered by different companies, allowing consumers to compare and choose the option that best suits their needs. These platforms work through two mechanisms: web scraping and the use of APIs (Application Programming Interfaces)[43].

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[41] Barnes, S., & Hunt, B. (Eds.). (2000). E-Commerce and V-Business (1st ed.). Routledge. https://doi.org/10.4324/9780080494623

[42] Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. Tourism Management, 29(4), 609-623.

[43] Kim, H., Xiang, Z., & Fesenmaier, D. R. (2015). Use of the internet for trip planning: a generational analysis. Journal of Travel & Tourism Marketing, 32(3), 276-289.

Web scraping is a technique that consists of extracting data from websites by analysing the HTML code of the pages[44]. Aggregators use programmes called 'crawlers' or 'spiders' to browse and analyse the pages of companies, extracting information on prices, availability, and characteristics of offers[45].

The use of APIs, on the other hand, allows aggregators to directly access company data via a more structured and standardized connection[46]. APIs function as a 'bridge' between the aggregator's platform and the company's information system, facilitating the exchange of data in real time.

Ticketing aggregators offer numerous benefits to both consumers and companies. For consumers, the ability to quickly compare prices and options available on a single platform reduces the time and effort required to find the best offer[47]. Furthermore, price transparency offered by aggregators can help reduce information asymmetries between consumers and businesses, promoting greater competition in the sector[48].

For companies, aggregators can offer greater visibility and access to the market, as consumers using these services are often looking for specific offers and have a higher purchase intention[49]. In addition, cooperation with aggregators can allow companies to reduce their marketing and ticket distribution costs, as the promotion and sale of offers takes place via the aggregator's platform[50]. Their ability to collect and present information in a clear and structured manner allows consumers to easily compare and choose the best option, while promoting greater competition and transparency in the market. Companies, on the other hand, can benefit from the increased visibility and market access offered by aggregators, as well as reduced marketing and distribution costs.

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[44] Boopathi, S., & Chelliah, J. (2013). Web scraping framework for mining e-commerce data. International Journal of Managing Public Sector Information and Communication Technologies, 4(2), 15-24.

[45] Olston, C., & Najork, M. (2010). Web crawling. Foundations and Trends® in Information Retrieval, 4(3), 175-246.

[46] Pautasso, C., Zimmermann, O., & Leymann, F. (2008). Restful web services vs. big web services: making the right architectural decision. In Proceedings of the 17th international conference on World Wide Web (pp. 805-814).

[47] Xiang, Z., Du, Q., Ma, Y., & Fan, W. (2017). A comparative analysis of major online review platforms: Implications for social media analytics in hospitality and tourism. Tourism Management, 58, 51-65.

[48] Clemons, E. K., & Weber, B. W. (1997). Competitive information technology strategies and policies for firms. Information and Management, 33(1), 25-37.

[49] Li, X., Wang, D., Liang, X., & Huang, D. (2017). The effect of online information sources on purchase intentions between consumers with high and low susceptibility to informational influence. Journal of Business Research, 77, 167-176.

[50] Breitenbach, C., & Van Doren, D. C. (1998). Value-added marketing in the digital domain: enhancing the utility of the Internet. Journal of Consumer Marketing, 15(6), 558-575.

Aggregator platforms, when acting as an intermediary for the end-user, with issuing platforms, a B2B business could be set up; in fact, partnership configurations can be created to obtain wholesale tickets or access to business offers. This approach can create a value chain that benefits both aggregators and their business partners while improving the offer and quality of services for end consumers[51].

In this context, aggregators can act as intermediaries or distributors, purchasing tickets directly from issuing platforms and reselling them to consumers through their own channels. This business model can generate several opportunities and challenges, including the need to manage logistics and ticket distribution, negotiate contracts and agreements with suppliers, and manage risks associated with price volatility and demand in the ticket market[52].

2.5.1 API functioning

APIs (Application Programming Interfaces) are a set of rules and specifications that enable software applications to communicate and interact with each other[53]. APIs are crucial for integration and interoperability between different platforms and services, as they enable the exchange of data and the realization of common functionalities in a simple and standardized way.

In the framework of ticket aggregation platforms, APIs can be used to capture and share information on prices, availability and characteristics of events and transport offered by various providers[54]. For instance, a ticket aggregator can use the API provided by a ticketing platform to request and display real-time data on available tickets for a specific event or travel date. This allows users to compare and choose between different options according to their preferences and needs.

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[51] Täuscher, K., & Laudien, S. M. (2018). Understanding platform business models: A mixed methods study of marketplaces. European Management Journal, 36(3), 319-329.

[52] Edelman, B., & Geradin, D. (2015). Efficiencies and regulatory shortcuts: How should we regulate companies like Airbnb and Uber? Stanford Technology Law Review, 19, 293-328.

[53] Pautasso, C., Zimmermann, O., & Leymann, F. (2008). Restful web services vs. "big" web services: making the right architectural decision. In Proceedings of the 17th international conference on World Wide Web (pp. 805-814).

[54] Yu, J., Benatallah, B., Casati, F., & Daniel, F. (2008). Understanding mashup development. IEEE Internet Computing, 12(5), 44-52.

2.5.2 Scraping functioning

Scraping is a technique used to extract data from web pages or other online resources[55]. Scraping can be achieved using programs or scripts that analyze the HTML code of web pages and extract specific information, such as text, images, links, and metadata.

In the case of ticket aggregation platforms, scraping can be used as an alternative or complementary method to APIs to collect information on prices, availability and characteristics of events and means of transport offered by various providers[56]. For instance, an aggregator may use scraping to extract ticket data from sales or event company websites that do not provide public APIs or that apply restrictions on the use of their APIs[57].

3 Possible solutions to solve the information asymmetries in C2C Market

3.1 Blockchain fundamentals

Blockchain technology is a form of distributed database that is decentralized and constantly updated with a record of transactions and events shared by network users.[58]

It is a digital ledger where data is transmitted over a network of computers[59], allowing anyone involved to modify the information without needing approval from a central authority[60]. The security of transactions is maintained through the technology's immutability characteristics and structure[61]. Additionally, encryption is used to provide secure authentication and verification of transactions, with validation relying on asymmetric encryption that uses two keys: one public and one private. This combination ensures that data can circulate on the network without being tampered with by third parties. It is important to note that while the public key can be derived from the private key, the reverse is not possible[62].

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[55] Munzert, S., Rubba, C., Meißiner, P., & Nyhuis, D. (2014). Automated Data Collection with R: A Practical Guide to Web Scraping and Text Mining. John Wiley & Sons.

[56] Boopathi, S., & Chelliah, M. R. (2014). Web data extraction techniques for a recommender system in the tourism domain. International Journal of Web Portals, 6(2), 1-15.

[57] Bizer, C., & Cyganiak, R. (2009). Quality-driven information filtering using the WIQA policy framework. Web Semantics: Science, Services and Agents on the World Wide Web, 7(1), 1-10

[58] H. Al-Breiki, M. H. U. Rehman, K. Salah, and D. Svetinovic. Trustworthy blockchain oracles: Review, comparison, and open research challenges. IEEE Access, 8:85675- 85685, 2020. doi: 10.1109/ACCESS.2020.2992698

[59] J. L. Zhao, S. Fan, and J. Yan. Overview of business innovations and research opportunities in blockchain and introduction to the special issue. Financial innovation, 2(1):1-7, 2016.

[60] A. HAYES. What is a blockchain? 2022. URL https://www.investopedia.com/ terms/b/blockchain.asp.

[61] Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang. An overview of blockchain technology: architecture, consensus, and future trends. In 2017 IEEE International Congress on Big Data (Big Data Congress), pages 557-564, 2017. doi: 10.1109/BigDataCongress.2017.85.

[62] C. Staff. What are public and private keys? 2022. URL https://www.gemini.com/ cryptopedia/public-private-keys-cryptography.

The private key is used to identify the sender of a message or transaction, while the public key is used to verify the sender's identity. In the context of Blockchain, the "message" is a transaction, and the public key serves as a unique public address for each participant. The public key not only verifies the sender's identity but also serves as an address to receive transactions. It is crucial to keep the private key safe, as releasing it could allow others to use the wallet maliciously.

The term 'blockchain technology' refers to a data structure in which information is stored in discrete blocks that are then connected to form a sort of chain[63]. A block consists of two components: the block header and the block body. In the block header, it is contained the Timestamp, the hash value of all transactions, Nonce (4-byte field used by miners), Hash (current block's hash value), and Parent block hash (hash value indicating the prior block). The block body includes transactions signed with the user's private key and verifiable with the public key. The block size determines the overall volume of transactions that can be stored in a block. Finally, once a block has been produced, it is distributed to miners, who must validate each transaction in the block. It is critical to note that the first block of a Blockchain is known as the genesis block, and it has no parent block.

Blockchains are divided into programmable and non-programmable.

- The programmable blockchain is a technology that allows programming logic, such as smart contracts, to be implemented directly on the blockchain. A distinctive feature of programmable blockchains is the possibility of creating decentralized applications (dApps) that operate on the blockchain itself[64].

- Non-programmable blockchains, such as Bitcoin, are limited to digital currency transactions and cannot perform complex conditional instructions. Programmable blockchains, such as Ethereum, on the other hand, allow for the creation of more complex and customized applications, offering greater flexibility and development possibilities[65].

As previously stated, Blockchain technology is aimed at eliminating the need for an intermediary, but it is difficult to manage all activities without coordination. As a result, there

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[63] Blockchain expert. URL www.blockchainexpert.uk.

[64] Christidis, K., & Devetsikiotis, M. (2016). Blockchains and Smart Contracts for the Internet of Things. IEEE Access, 4, 2292-2303

[65] Mougayar, W. (2016). The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology. John Wiley & Sons.

are a variety of algorithms known as "Consensus Mechanisms" whose function is to evaluate how a transaction can be validated and, as a result, to update the register[66]. A consensus algorithm is a set of rules that define the steps to be taken when validating blocks. Miners are the agents in charge of this process in PoW but there are several types of consensuses in the Blockchain world: only the two mainly used are discussed in this chapter to help readers understand the key differences.

Bitcoin was the first Blockchain to be established, and it implements the Proof of Work mechanism. Its core idea is to use cryptographic competition to allocate validation privileges and rewards among miners[67]. The separate mining nodes calculate the exact solution to a computational problem conditioned by the difficulty level based on the previous block's information, and the first miner that solves the problem can generate the next block and get a specific quantity of Bitcoin as remuneration.

This method ensures an elevated level of network security because an intruder who wishes to change a block must redo the proof-of-work for every block related to the one already evaluated[68]. One disadvantage of the system is that miners expend computing effort to validate transactions but are not compensated for their electrical costs if they do not win the competition, rendering their efforts worthless. This is the major shortcoming of the POW (Proof of Work) process, and many networks are shifting to a different type of consensus.

Many methods of consensus have been created over time to address the limits of Pow, but Proof of Stake has garnered the most attention.

Rather than using processing power to choose miners for validation, an algorithm selects validators at random based on two criteria linked to the coin they have staked. The probability of being chosen is related to the miner's total quantity of tokens staked and the length of time the coin has been staked. The term stake refers to the miner's loss if the verification process is inaccurate. This feature reduces energy consumption while simultaneously boosting scalability and[69].

Once the block is uploaded to the ledger, the validator is rewarded with transaction fees and, if desired, a currency reward. The latter can differ based on the blockchain used for the process, as each has its unique set of rules. In general, POS (Proof of Stake) systems use a combination

[66] G. Parma. International blockchain startups ecosystem: a comprehensive business model taxonomy. 2022.
[67] D. Mingxiao, M. Xiaofeng, Z. Zhe, W. Xiangwei, and C. Qijun. A review on consensus algorithm of blockchain. In 2017 IEEE International Conference on Systems, Man, and Cybernetics (SMC), pages 2567-2572, 2017. doi: 10.1109/SMC.2017.8123011.
[68] G. Parma. International blockchain startups ecosystem: a comprehensive business model taxonomy. 2022
[69] What is proof of stake (pos)? 2022. URL https://academy.binance.com/it/ articles/proof-of-stake-explained.

of characteristics such as staking lifespan and node worth, as well as randomness, to promote nodes other than the richest nodes on the network.

Proof of Work and Proof of Stake are two of the most common consensus algorithms used in blockchain, and as just seen they use different mechanisms.

	Proof of Work (PoW)	Proof of Stake (PoS)
Concept	Solving a complex computational problem	Possession of a quantity of coins (staking)
Miner/Validator	Miner	Validator
Miner/Validator Selection	The first to solve the problem.	Based on the number of coins in staking
Energy consumption	High	Low
Scalability	Low	High
Security	Very High	High
Decentralisation	High	Depends on the initial distribution of coins (premine)
Examples	Bitcoin, Ethereum, Litecoin…	Cardano, Polkadot, Algorand…
Incentive	Cryptocurrency rewards	Cryptocurrency rewards and voting rights
Centralisation problems	High mining costs concentrated in a few regions	Stake concentration in a few hands

In summary, Proof of Work requires that miners solve a complex computational problem to validate transactions on the blockchain network. This process requires high energy consumption and makes it difficult to scale the network. On the other hand, Proof of Stake requires participants to possess a quantity of coins in the network (staking) to be selected as a validator. This method reduces energy costs and makes the network more scalable but depends on the initial distribution of coins. In both cases, participants are incentivized to participate in the consensus process through cryptocurrency rewards. However, Proof of Stake also offers voting rights to participants in proportion to the number of coins held.

3.2 Blockchain-based E-commerce

As has been understood so far, traditional marketplaces are characterized by problems of security, transparency, and reliability, a paradigm shift in the system could lead to solving these problems and improving the user experience. The risk of running into scams, is present on both the seller's and the buyer's side, from the buyer's point of view, the risk is to pay not to receive a digital good/asset in exchange, on the seller's side he could be scammed by the moral hazard of the buyer, since by sending the good, thus no longer having material possession of it, he remains without the agreed money, as the buyer could pretend to send the consideration, or he could send the agreed consideration and ask for a refund to the central authority.

Creating an online buying and selling platform (e-commerce) using blockchain technology means developing a decentralized platform. Using self-executing smart contracts to secure deposits and payment processes. A smart contract regulates the terms and conditions of an agreement between parties. It stores information, processes input, and writes outputs through its predefined functions. It stores information, processes inputs, and writes outputs thanks to its pre-defined functions[70] A smart contract is likely to be a class that includes state variables, functions, function modifiers, events, and structures which is intended to execute and control relevant events and actions according to the contract terms. Each contract includes states and functions. The former are variables that hold some data or the owner's wallet address. However, unlike a traditional contract, the terms of a smart contract are executed on the basis of a code programmed on a blockchain. Once the contract has been defined it can be deployed to the blockchain and it automatically executes its instructions when all specified conditions are met, this ensures that transactions only take place if the specified conditions have been met.

Transactions, through the immutability of the blockchain network, are verified by blocks and recorded in a decentralized ledger. Smart contracts can perform credible transactions without trusting third parties, and the transactions on the blockchain are trackable and irreversible. Therefore, both the buyer and the seller cannot breach the contract. All processes are recorded on the blockchain including the product launch, purchase, delivery, and payment. Blockchain-based e-marketplace enables information sharing, co-certification, and transaction storage for all participants on the network. It can connect sellers and buyers directly, so it can reduce commissions and improve transaction efficiency. These applications provide more convenient

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[70] Buterin V et al (2014) A next-generation smart contract and decentralized application platform. White paper

consumption processes for users[71]. The implementation of smart contracts is done through a 'compilation' process in which users define the terms of the contract, such as payment terms and delivery methods.

In traditional e-commerce, the transaction register is centrally managed by an intermediary, such as a bank or credit card company. One of the main problems of traditional e-commerce platforms is the lack of transparency and trust among users. This is because sellers can easily manipulate product and price information, while customers can provide false information on identity and product reviews. This can lead to a loss of trust among users and a reduction in transaction volume.

Among the main differences that need to be highlighted is the fact that traditional systems require the presence of a central third party to manage transactions and information, which can cause security and reliability problems. In contrast, blockchain allows for decentralized management, which makes information manipulation and fraud more difficult, we have the so-called elimination of the intermediary. The elimination of the middleman also makes it possible to simplify payment processes, guaranteeing greater security of transactions given that confidential information passes through fewer systems, also avoiding data leaks less time of processing, and a reduced total cost of the process. However, the development of blockchain requires specific technical knowledge and may involve higher costs than traditional systems.

Feature	Blockchain	Traditional systems
Type of architecture	Decentralised	Centralised
Security	High, thanks to the use of advanced cryptography and the distribution of information between network nodes	Relatively low, as information is generally stored in a single centralized database and is vulnerable to cyber-attacks.
Verification of transactions	Automatic and real-time, thanks to distributed validator nodes confirming the validity of transactions.	Requires the involvement of trusted intermediaries, such as banks or credit card companies, to verify the validity of transactions.

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[71] Chang, Y.-W., Lin, K.-P., & Shen, C.-Y. (2019). Blockchain Technology for e-Marketplace. In 2019 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops) (pp. 429-430). Kyoto, Japan. doi: 10.1109/PERCOMW.2019.8730733.

Efficiency	High, as transactions can be executed quickly and securely without the involvement of intermediaries.	Relatively low, as transactions take time to be processed and verified by intermediaries.
Costs	Low, as no intermediaries are needed, and transaction costs are generally very low.	High, as intermediaries charge a commission for their services.
Traceability	High, as transactions are permanently recorded on the blockchain and can be easily tracked by any centralized party.	Relatively low, as information can be easily modified or deleted by those responsible for the analysed database.
Privacy	High, as the blockchain uses user anonymity and advanced cryptography to protect personal information.	Relatively low, as personal information can be easily accessed by those responsible for the analysed database.

However, it should be mentioned that to date blockchain also presents some limitations and challenges, such as the need for adequate technological training to use the platform. As of today, buying and exchanging cryptocurrencies is not easily accessible at the interface level for users.[72]

The identification and verification of users are crucial to ensure security and trust in the blockchain-based e-marketplace[73]. User identification is done by creating a personal account, where users must provide their information, which will then be verified through an authentication process. Verification of users is instead carried out by registering them to a public or private blockchain, where their transactions are permanently and immutably recorded[74]. In this way, the veracity of users' information can be easily verified, and the possibility of fraud or illegal activities is reduced. User feedback is recorded in the blockchain and used to calculate a reputation score for each user. In this way, users with a good reputation will be favored and have access to benefits such as discounted rates or increased visibility in

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[72] https://www.coindesk.com/layer2/2022/04/15/yes-crypto-is-cool-but-how-about-starting-with-more-user-friendly-tools/

[73] Mougayar, W. (2016). The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology. John Wiley & Sons.

[74] Swan, M. (2015). Blockchain: Blueprint for a New Economy. O'Reilly Media, Inc

the marketplace, while users with a negative reputation will be penalized. In addition to those mentioned above, there are numerous and substantial differences between the use of blockchain and traditional systems for the creation of an e-marketplace. In the marketplace, smart contract logic is applied, and it can do autonomous transactions according to the pre-defined rule if verified. The underlying smart contract performs data registration and purchase functions, which are represented as a transaction in Ethereum. In a hypothetical Ethereum based marketplace, ETH performs the transaction in a safe and transparent way and stores the results. The information registry manages the profile information of the registered data and functions. It stores and manages profiles in the form of metadata. When consumers send query requests, it provides the keyword-based search result[75].

All functions traded in the marketplace should be paid and their accesses are controlled. Similar to the data key management server, the function token management server verifies whether the requestor is a buyer or not when it is requested to issue a function token, and when successfully verified, issues a function token, and sends it. Data providers and function providers can use the marketplace client to register data/functions or to check the information that has been sold.

3.2.1 Blockchain-based E-commerce for virtual goods

Deepening the market for digital goods, which are digital representations of tangible objects in the physical world, is frequently used to enhance the consumer's experience in online gaming and social media.

The current market size is nearly $32 billion[76] and according to Adroit Market Research, the global virtual goods market value is poised to reach $189.76 billion by 2025[1] . The expansion in the global virtual goods market is driven by the rapid growth of online gamers who purchase virtual goods, such as in-game weapons or upgrades, using real money.

One of the most critical and challenging issues here is how we can prevent piracy during such transactions.

The argument that conveying the right to sell virtual items would promote piracy is based on the fact that illegally reproduced virtual items are difficult if not impossible to distinguish from

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[75] De Filippi, P., & Loveluck, B. (2016). The invisible politics of Bitcoin: Governance crisis of a decentralized infrastructure. Internet Policy Review, 5(3)

[76] Elks, S. (2020). Virtual goldmine: In-game goods fuel debate over digital ownership. Reuters. https://www.reuters.com/article/us-global-videogames-property-analysis-t/virtual-goldmine-in-game-goods-fuel-debate-over-digital-ownership-idUSKBN1Y0032.

reproductions that have been brought into circulation with the consent of the developer[77]. However, the recent emergence of blockchain technology may revolutionize the ownership of virtual goods, as it allows developers to track provenance and establish the chain of custody. Virtual goods can have an economic value that depends on user demand, the number of goods available on the market, and their usefulness to users. These factors may influence the dynamics of the market for second-hand virtual goods.[78]

However, it must be recognized that the adoption of a decentralized platform requires the adherence of a sufficient number of users and the creation of incentives for participation in the network, potential challenges in this regard could be the lack of standardization of virtual goods, market regulation and the issue of user data privacy.

Incentives are a crucial element in ensuring that the blockchain network is secure and reliable. In the case of a blockchain-based marketplace for second-hand virtual goods, incentives can be provided through the creation of a market-specific cryptocurrency.

Users who contribute to the proper functioning of the network, e.g., by validating transactions or providing computational resources, can be rewarded with this cryptocurrency. In this way, an incentive system is created that promotes active participation in the network and its security. Incentives can also be used to incentivize users to leave honest and accurate feedback on transactions. For example, users could be rewarded with marketplace cryptocurrency for posting truthful and useful reviews. This would help ensure transparency and quality of transactions within the marketplace.

3.2.2 Algorand Insight

Within this thesis work, it was decided to focus on a specific blockchain network based on Proof-of-Stake (Pos), i.e., Algorand, and then to investigate it further with the case study. Algorand is designed to be a scalable blockchain platform that can quickly process large numbers of transactions, compared[79]Algorand speeds up transaction times by using a consensus algorithm focused on the problem of generals Byzantine (he difficulty of achieving consensus within a distributed network when faced with the possibility of faulty or malicious component) running a public ledger without authority. Using a variant of Proof of Stake (PoS), which allows

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[77] Jütte, B. J. (2017). Reconstructing European copyright law for the digital single market between old paradigms and digital challenges. Nomos Publishing.

[78] Implications of blockchain-powered marketplace of pre-owned virtual goods' Yinliang (Ricky) Tan

participating users to validate transactions on the network according to how many ALGO tokens they hold[80]. This approach is intended to make it easier and faster to reach a consensus on the Algorand network while also reducing the risk of 51% attacks.

The Algorand platform is based on a new consensus algorithm called Pure PoS, which is intended to address the scalability and security issues associated with traditional proof-of-work (PoW) and proof-of-stake (PoS) consensus mechanisms. It was founded in 2017 by Silvio Micali, a computer scientist and cryptography professor at MIT.

Proof of Stake blockchains are scalable, but often at the expense of having a limited number of validators with many validating betting control blocks. Proof of Work (Pow) has the same problem, as large mining pools always win the race to create new blocks. In contrast, Algorand's PPoS consent mechanism randomly selects validators from all those who have developed and generated a participating key. The possibility of being selected directly depends on the relationship between the participant's determined bet and the total bet amount. The small sum holder obviously has fewer chances of being selected than the large sum holder. Contrarily to proof-of-stake blockchains, Algorand does not necessitate a minimum stake, thereby eliminating a notable entry barrier for the average user.

Once users have contributed and generated their participation keys, they become participating nodes. Communication between these nodes is via Algorand relay nodes. The block proposal phase then selects multiple block proposals using a verifiable random function (VRF) considering the contribution ratio of each validator[81]. Once validators are selected and the block it's ended, their identities are kept secret until a new block is offered. This improves network security because attackers cannot target the designated controller. However, the proposer can show their VRF results with the proposed block to prove their case.

After the block is submitted, the participating nodes are randomly selected to join the soft voting committee. This step filters proposals so that only one candidate can add a blockchain. The voting power in the soft committee is proportional to the sum of the contribution of each node and the votes are used to select the proposed block with the smallest VRF spread. This means

[80] Chen, J., Gorbunov, S., Micali, S., & Vlachos, G. (2020). Algorand: A secure and efficient distributed ledger. Theoretical Computer Science, 812, 30-60.
[81] Chen, Jing, and Silvio Micali. "Algorand." *arXiv preprint arXiv:1607.01341* (2016).

that it is difficult to proactively attack a blocker because it is not so easy to predict the lowest VRF hash value.

A new committee is then created to check the cost and integrity of transactions during the soft vote phase in the selected block. If the committee deems the work useful, a block will be added. Otherwise, the block is rejected, the blockchain enters recovery mode, and a new block is selected. The possibility of forking (the process where the blockchain diverges into two different paths - either temporarily or permanently - often due to a change in protocol or to reverse the effects of fraudulent transactions) with Algorand is rare, as only one block proposal at a time reaches the certification stage. Then, once a block is added, all transactions are considered final.[82]

ALGO is the native Algorand coin that serves as the foundation of its network structure. The benefits provided to validators for creating blocks are divided and dispersed among all ALGO coin holders, rather than being awarded just to block producers. As of February 2021, all ALGO coin holders can receive around a 7.5% annual percentage yield (APY). The distribution of rewards occurs around every 10 minutes and is meant to encourage people to join the Algorand staking platform and hasten the route to decentralization.

To access earned incentives, they may keep ALGO in a wallet or on an exchange. ALGO is capped at 10 billion tokens, created at the time[83] in 2019. Many of those coins are locked up and have yet to be distributed. Some of the tokens have been allocated to the organizations that are developing the Algorand platform.

ALGO also acts as a utility token. If you build an application, you will need ALGO to pay transaction fees and to serve as minimum balance deposits if you want to store data on the blockchain. Is designed to be a payments-focused network with rapid transactions and a focus on achieving near-instant finality - that means processing over 1,000 transactions per second (TPS) and achieving transaction finality in less than five seconds.[84] Comparison table between traditional PoS and Algorand-based PoS:[85]

[82] What Is Algorand? Algorand Staking With ALGO Coins | Gemini
[83] https://www.coindesk.com/markets/2019/06/19/algorand-raises-60-million-in-token-sale/
[84] "What Is Algorand? Algorand Staking With ALGO Coins | Gemini" n.d., https://www.gemini.com/cryptopedia/what-is-algorand-cryptocurrency-blockchain.
[85] **Reputation-based PoS for the Restriction of Illicit Activities on Blockchain: Algorand Use case** Mayank Pandey, https://arxiv.org/abs/2112.11024

Feature	Traditional PoS	PoS based on Algorand
Selection of validators	Validators are selected according to the number of tokens they have, giving more weight to those who have more.	Validators are randomly selected through the Algorand protocol, which guarantees a uniform selection probability.
Scalability	Scalability depends on the number of tokens held by validators. There are limits on the number of transactions the system can process.	The system is highly scalable due to the random selection of validators and the multi-level structure of Algorand.
Security	The system is susceptible to majority attacks (51% attack), in which a single actor controls most of the tokens and thus the decision-making process.	The system is designed to prevent majority and other types of attacks, ensuring a fair and secure decision-making process.
Cost	The costs of becoming a validator are high, as they require a large number of tokens.	The cost of becoming a validator is relatively low, as the Algorand protocol requires only a small amount of tokens to participate.
Incentives	Validators only receive rewards based on the number of tokens they have but are not rewarded for their contribution to the security and scalability of the system.	Validators receive rewards based on their active participation in decision-making and contribution to the security and scalability of the system.

In general, Algorand-based PoS theoretically offers greater security, scalability, and active participation of validators than traditional PoS Furthermore, the cost to participate as a validator is relatively low, ensuring a decentralization of the network.

4. Trust.io - Business model

Trust.io's business model is based on the creation of a blockchain-based ticket aggregator and marketplace. In this ecosystem, Trust.io acts as an intermediary between ticket sellers (for events, concerts, theatres, sports, trains, etc.) and buyers.

To generate revenue, Trust.io will implement a per-transaction commission model. Each time a ticket is resold through the platform, Trust.io will take a percentage of the sale as a commission. This approach is beneficial because it allows Trust.io to generate revenue in a manner that is proportional to the volume of transactions made on the platform.

In addition to this main source of revenue, Trust.io can explore other monetization opportunities such as the sale of advertising space, aggregated data sales, and native token exchange fees.

Trust.io's business model can thus be considered a "commission per transaction business model", in which the company generates revenue from every transaction that takes place on its platform.

It is important to note that the key to Trust.io's success lies in being able to attract enough sellers and buyers to create a vibrant and competitive marketplace. To this end, Trust.io needs to invest in building a user-friendly, secure, and transparent platform, and effective marketing strategies to attract users to the platform.

4.1 Explanation of the idea

Trust.io's proposal is that of an advanced digital ecosystem designed to manage the buying and selling of event and transport tickets securely, transparently, and efficiently between individuals. This is pursued through the implementation of innovative technologies such as blockchain, which guarantees the traceability and immutability of transactions, providing a high level of security and transparency.

A further key technological tool is the adoption of smart contracts based on Algorand's blockchain. These smart contracts underpin the functioning of the exchange and purchase of tickets, managing the entire process autonomously and ensuring the inalterability of transactions.

Trust.io's platform acts as a ticket marketplace aggregator that then keeps tickets in a secure cloud environment accessible until hours before the event. This solution eliminates the problems associated with lost or physically stolen tickets while allowing the user to resell tickets easily and securely until the last moment. This functionality introduces a level of flexibility currently non-existent in the ticket market, increasing the attractiveness of the platform.

Engagement is further enhanced by the tokenization mechanism, which involves the issuing of tokens on Algorand. These tokens are used as incentives to promote good behavior among users and to establish trust and loyalty within the platform. Each transaction performed by users on the platform generates a reward in the form of tokens, which can be kept for future benefits or withdrawn once a certain threshold is reached.

Trust.io offers an unprecedented experience in ticket exchange between individuals. Through the innovative use of blockchain and smart contracts, Trust.io offers a cutting-edge solution that

combines security, transparency, flexibility, and incentive, revolutionizing the ticket-buying and selling industry.

4.2 Market Analysis

4.2.1 Market segmentation

Trust.io is aimed at a broad spectrum of buyers, including people with low to upper-middle incomes. The price discriminator is not specific, as it aims to cover a broad income area. However, there are differences in purchase preferences between the two income segments identified.

- The first segment consists of people with a low average income who might be interested in tickets for less popular events. This might include concerts by emerging or less well-known artists, less popular theatre shows, niche festivals, and lower-level sporting events. These buyers are more price sensitive and look for opportunities to save money; therefore, they might be attracted by tickets resold at a lower price.
- The second segment consists of people with an upper middle income who are willing to pay a higher premium to obtain tickets for popular and sold-out events. This might include concerts by famous artists, successful theatre performances, major festivals, and important sports matches. These buyers are willing to invest more to get access to unique, high-quality experiences.

The type of tickets that can be purchased within the platform include coupons for events, including concerts, theatre performances, festivals, sporting events, and train tickets. The initial geography focused on is the Italian area but with the potential to expand later to other regions and countries, as the business presents itself as scalable and replicable since it does not present any geographical or operating entry barrier. The relevant factor to consider for an expansion outside the Italian borders is the internal legislation of the different countries, which is generally permissive and favorable to regulated exchanges.

4.2.2 Position Analysis in the Ansoff Matrix

To identify Trust.io's position within the market, one of the methods used is the Ansoff matrix, which is a widely used strategic model for analyzing a company's growth options. It helps to assess possible directions of company development, in terms of markets and products/services, to guide targeted strategic decisions. Trust.io is at the 'Market Development' stage of the Ansoff

matrix. This phase involves the introduction of an existing product or service into a new market. A digital platform is offered for buying and selling tickets, which already exists, but introducing the possibility of being able to resell tickets in total security and transparency, offering, in addition, a cloud ticketing service and remuneration.

By segmenting the market and offering tickets for several types of events, one seeks to expand one's presence in a growing market by offering a secure and transparent solution for online buying and selling. With the initial focus on the Italian area, one can acquire a solid customer base and subsequently expand into other geographic markets.

This market development strategy makes it possible to capitalize on the needs and preferences of different income segments, reaching both consumers interested in more affordable tickets and those willing to pay more for prestige events.

4.2.3 Market Size and Trends

The market for online buying and selling of event and transport tickets is a growing sector, characterized by strong consumer demand for access to cultural, sports and entertainment experiences. The size of this market is significant and offers many opportunities for our start-up.
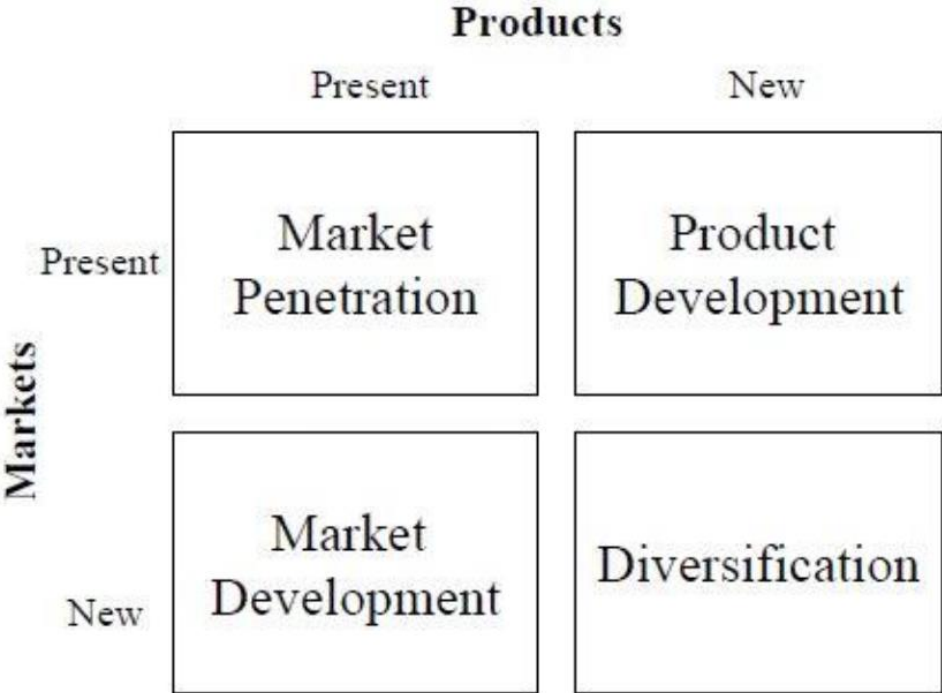
Figures 1 - Ansoff Matrix

Market Size:

- The Italian online market for buying and selling concert tickets was estimated at 450.5 million euro. The event ticketing sector has experienced considerable development, thanks to the growing popularity of concerts, festivals, theatre performances, sporting events and much more[86].

- Even secondary ticketing, although difficult to find accurate statistics for the informal market, one can get an approximate statistic of the number of exchanges that take place between private individuals, which on social media alone are around 500-1000 tickets put up for sale. These tickets are put up for sale within groups of between 40 and 60 thousand participants.[87]

Market Trends:

- A significant trend in the ticket-buying market is the growing consumer preference for online purchasing over traditional channels. The accessibility and convenience offered by digital platforms has driven more and more people to make their ticket purchases online. Making it soar by 43% in Italy alone compared to pre-Covid estimates[88].

- The evolution of digital technologies has made the implementation of advanced ticket verification and authentication systems possible. More ticket vendors are implementing anti-bagging techniques that aim at the secure resale of tickets between users[89].

- In addition, there is an increasing focus on transparent refund policies and flexible ticket resale solutions to meet consumer needs and offer a more complete shopping experience.[90]

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[86] https://www.ilsole24ore.com/art/concerti-ricavi-450-milioni-43percento-gennaio-e-settembre-vasco-trento-piu-visto-AEDOlUJC

[87] Raw information taken trough social media analysis.

[88] https://www.ilsole24ore.com/art/concerti-ricavi-450-milioni-43percento-gennaio-e-settembre-vasco-trento-piu-visto-AEDOlUJC

[89] https://www.ticketone.it/campaign/comunicati-stampa

[90] https://www.fansale.it/fansale/advantages.htm#fair

4.2.4 Competitor Analysis and market opportunities - Porter Analysis

The market landscape in which Trust.io operates has several competitors, represented in the chart below. Each of the competitors present offers similar functionalities to those of Trust.io, but none of them combine them entirely, which is why the value proposition of the proposed start-up is unique.
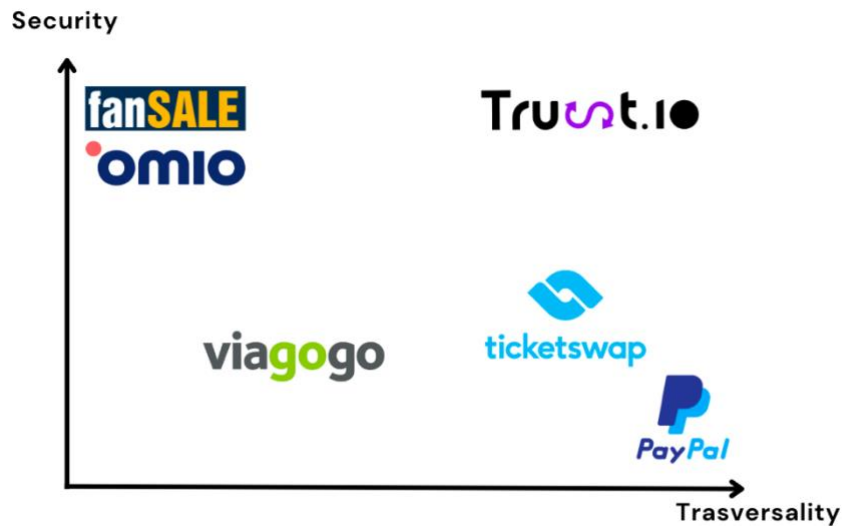

Figure 2- Competitor Analysis

To conduct a competitor analysis, it is important to carefully examine the functionalities that each of them offers. Let's look at each platform and its main features:

- FanSale: This is a ticket resale platform that allows users to buy and sell tickets at fair prices. Key features include a price control system to prevent overpricing and a money-back guarantee in case an event is canceled. It is limited only to events sold by the TicketOne circuit.

- TicketSwap: This platform also offers the possibility to buy and sell tickets. It has a price control system similar to that of FanSale and offers extra security through ticket verification. But unlike Trust.io, it does not allow security by default, as it does not allow the ticket to be originally purchased on the app via the merchant's site, thus requiring additional ticket verification.

- Viagogo: Viagogo is a global marketplace for live event tickets. It has a wide international reach but has come under criticism for a lack of transparency in pricing. Here, too, the ticket verification system has to be done later and is not by default.

- Paypal: Although PayPal is not a ticket marketplace, it is a very popular online payment system among users who exchange tickets with each other. It has a large user base, but

it does not offer any specific functionality for buying and selling tickets and does not offer 100 percent protected guarantees for either the seller or the buyer.

- Omio: This is a travel booking platform that allows you to book trains, buses, and flights throughout Europe. It is an aggregator platform (like Trust.io) but does not offer the possibility to resell tickets.

Porter Analysis

Trust.io, with its blockchain technology, differentiates itself from these competitors. Its unique value proposition includes the transparency and security of blockchain, a cloud ticketing and ticket verification by default service that can help prevent fraud and ensure secure and verified transactions. Porter's five forces provide a useful framework for analyzing the competitiveness of an industry. Here are how these forces could be applied to the Trust.io context, rating the difficulty of entering the market with a grade from 1 (very easy) to 5 (very difficult):

- **Competition among existing competitors:** Competition in the online ticketing market is intense, with numerous ticketing services and resale platforms. 4/5
- **The threat of new entrants:** Entering the online ticket market requires significant investment in technology and marketing, but the growth of blockchain technology could facilitate the entry of new competitors. Trust.io can mitigate this threat due to its position as a first entrant in the blockchain industry. 4/5
- **Bargaining power of suppliers:** Suppliers in this context are event promoters and ticketing venues. They have high bargaining power as they can choose between different platforms for ticket sales. Trust.io can attract these suppliers by offering lower fees and more transparency. 3/5 Event promoters and venues have some power but can be attracted by lower commissions and more transparency.
- **Bargaining power of customers:** Customers have moderate bargaining power. They can choose between different platforms, but their choice may be limited by ticket availability. Trust.io can attract customers by offering fairer prices, more security, and a better user experience. 3/5 Customers have several options, but their choice might be limited by ticket availability.
- **Threat of substitute products:** Live event tickets have no real substitute products, but the growing popularity of virtual and streaming experiences could pose a threat. Trust.io can address this challenge by ensuring that the platform is the safest and most

convenient place to buy tickets for live events. 2/5 2. There are no real substitutes for live event tickets, but virtual and streaming experiences are becoming more popular.

On average, the difficulty of entering the online ticket market could be assessed as challenging, but not impossible, especially if the company can differentiate itself using innovative technologies such as blockchain.

4.3 Description of product and services

The start-up offers an innovative online platform that facilitates the secure buying and selling of event and transport tickets between individuals. The main objective is to reduce the incidence of online scams in this segment by providing a secure, transparent, and trustworthy exchange environment. Users can buy, exchange, and store their tickets on the platform, with the possibility of reselling them up to a few hours before the event or departure. In addition, the platform offers a token-based incentive system to promote positive behavior and customer loyalty.

Trust.io aims to solve many common problems related to the purchase, holding, and resale of tickets for events and transport.

- There comes the question of security and trust in the purchase of tickets between private individuals. Thanks to the application's logical flow, information asymmetry and moral hazard - problems typical of peer-to-peer transactions - are eliminated. Every transaction is transparent and secure, providing buyers and sellers with unprecedented peace of mind. This is enabled by the fact that it is the platform itself, via the merchants' sites, that issues the ticket; no longer will a situation arise in which a seller pretends to have a ticket that he or she does not possess. It will also eliminate the casuistry of sellers who possess the ticket, and sell it correctly, but possess the duplicate pdf still show up at the time of redemption, making it difficult to track them down. And as a final basic casuistry, the fact that the buyer sends the money to the seller, who does not share any ticket, is eliminated; this casuistry is eliminated precisely by the intermediation of the platform (which until the moment of redemption is the only one to possess the coupon).
- Furthermore, Trust.io solves the problem of lost tickets. With tickets stored in a secure cloud environment and made available to the user only hours before the event, there are no more worries about tickets being lost in emails or sent to the wrong addresses. This eliminates a great deal of stress for many event participants.

- Finally, users are offered the possibility of buying a ticket before it sells out and reselling it freely. This means that fans still can attend their favorite events even if tickets are sold out, and those who can no longer attend an event can resell their tickets safely and easily.

Ticket aggregator

In the context of Trust.io, the ticket aggregator concept is applied in the creation of a unified platform that brings together different ticket providers for events and transport. Instead of having to navigate through numerous sites or platforms to find and buy tickets, users can do so in one place, making the process much simpler and more convenient. The operation of the ticket aggregator is based on several key steps:

- **Ticket acquisition:** Trust.io via APIs on publicly available or saleable sites, or via web scraping, allows tickets to be acquired directly from the operator's site but via mediation. Mediation allows the data to be modified in the back end and made visible in the front end to the end user.
- **Ticket storage:** Once purchased, tickets are stored in a secure cloud environment until a few hours before the event. This not only eliminates the risk of lost or physically stolen tickets but also enables the secure resale of tickets.
- **Ticket delivery: A** few hours before the event, tickets are made available to the user or new buyer, ensuring that the ticket can only be used by the correct person.

4.3.1 Blockchain-based platform

Blockchain technology plays a key role in ensuring the security and transparency of the platform. The blockchain is a distributed, immutable ledger that records transactions in a secure and verifiable manner. This technology can be used to ensure the authenticity of tickets and the security of transactions.

In the context of the platform, each ticket and each subsequent transaction is registered on the blockchain via a smart contract, is recognizable by a unique transaction code. This token represents proof of ownership of the ticket and can be transferred from one user to another via the platform. As each transaction is recorded on the blockchain, it is possible to trace the entire history of each ticket, from the moment it enters Trust.io's platform to final resale.

The fact that information on the blockchain is immutable and transparent helps prevent fraud, as it is impossible to alter or forge a ticket once it has been registered. In addition, the decentralized nature of the blockchain makes the platform resilient to problems typical of platforms acting with intermediaries, ensuring a reliable service to users.

Finally, the tokenization system also provides incentives for positive behavior. Users can earn tokens for certain actions, such as completing a transaction or reviewing a purchase, and these tokens can be used to obtain discounts or other benefits on the platform.

4.3.2 Native Token Based on Algorand

The proposed platform uses a native token based on Algorand's blockchain. This cryptocurrency is used both as a transaction tool within the platform and to incentivize positive behavior among users. The native token is generated on the Algorand network via a smart contract that ensures that the rules of the token are respected and that transactions take place as intended, without the need for an intermediary.

The incentive mechanism is structured in such a way that a small percentage of tokens is awarded to users for each transaction made. These tokens can be accumulated and used in two ways: they can be 'staked' on the platform to earn returns, or they can be withdrawn once a certain limit is reached.

The token-based incentive mechanism is a key component of the customer loyalty strategy. It helps to create a safe and reliable online ticket buying and selling environment, incentivizing honest and transparent behaviors. At the same time, it offers users the opportunity to earn returns on their tokens, creating an additional incentive to actively participate in the platform.

4.3.3 Wallet and Staking

In the proposed business model, a key functionality is the digital wallet, or "wallet", integrated into each user account. This wallet, although based on blockchain technology, is designed with an intuitive and user-friendly user interface. It offers users the ability to manage digital tokens obtained through transactions on the platform in a manner like a mobile banking application. However, unlike a traditional banking application, each wallet is associated with a unique

address on the blockchain, allowing users to manage their tokens in a secure and transparent manner.

Another distinctive element of the business model is the implementation of the staking mechanism. This functionality, although a complex concept derived from blockchain technology, is made accessible and understandable to the average user through a clear and simplified interface. Users can easily stake their tokens directly from their wallet, with the opportunity to receive returns in the form of new tokens.

The staking mechanism not only offers benefits to users in the form of rewards but also helps to ensure the stability and security of the blockchain network. However, the technological complexity of this process is hidden from the user, who can exploit the benefits of staking with the simplicity of a click.

4.3.4 Cloud ticketing service

The cloud ticketing service is a central element of this platform's value proposition. This service, which leverages cloud technology and blockchain, allows users to purchase tickets for events and transport and store them securely and transparently.

Upon purchase, the user receives a temporary QR code. This code certifies that the user has purchased the ticket, but it is not yet valid for access to the event or means of transport. This mechanism allows the user to resell the ticket through the platform up to a few hours before the event.

If the user decides not to sell the ticket, he or she can redeem it through the platform and receive the original ticket, thus converting the temporary QR code into a definitive QR code that will be valid for access to the event or means of transport.

This cloud ticketing system offers several advantages. On the one hand, it ensures the authenticity of tickets, eliminating the risk of fraud. On the other, it increases flexibility for users, who can decide to resell their tickets up to a few hours before the event. Finally, the cloud ticketing service integrates seamlessly with the platform's other features, such as the digital wallet and staking mechanism, creating a smooth and consistent user experience.

4.3.5 Pirate metrics - AAARRR

To gain a concrete understanding of how to enter the market, the AAARRR funnel[91], also known as Pirate Metrics, is a user behavior analysis model created by Dave McClure, a start-up scholar. The model divides the user experience into five key phases: Awareness, Acquisition, Activation, Retention, Revenue, and referral. It was implemented, in a concrete and realistic way, for an initial market launch this way:

Awareness

- **User action:** after visiting Facebook and Instagram pages, follow the link to the landing page.
  - **KPI**: *growth rate of visitors on a weekly basis, CTR (Click-through rate) rate of users that visit our landing page.*

- **Social media posts/videos on major events or concerts:** Create content highlighting major events or concerts. These articles or posts can highlight the unique features of the event and how the platform can facilitate the purchase of tickets.
  - **KPI:** *Engagement Rate, measures the level of user interaction with content on social media. It can be calculated by adding up the total number of likes, comments, shares, and other interactions, and dividing by the total number of views or followers.*

- **Social media posts/videos on information content:** Creating information content. Information articles and posts about the world of culture and entertainment.
  - **KPI:** *Engagement Rate, measures the level of user interaction with content on social media. It can be calculated by adding up the total number of likes, comments, shares, and other interactions, and dividing by the total number of views or followers.*

Acquisition

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[91] https://www.gartner.com/en/digital-markets/insights/growth-loops-vs-aarrr-funnel#:~:text=The%20AAARRR%20funnel%2C%20also%20known,ensure%20a%20successful%20growth%20strategy

- **User action:** following the page on Facebook and Instagram, leaving the email thus receiving a coupon.
  - ○ **KPI**: *rate the number of clicks on links sent through email over the number of emails sent.*
- **SEO content:** Create relevant and search-engine-optimized content on the website (blogs, guides, events, and travel tips) to attract organic visitors.
  - ○ **KPI**: *Organic traffic. This indicates the number of visitors arriving at the site via non-paid search results.*

- **Games and competitions:** Launch games and competitions on social media, where users can have the chance to win free tickets or discounts if they share the competition post or tag a friend. This can help spread awareness of the platform quickly.
  - ○ **KPI**: *number of people who actually participate in the game or competition compared to the total number of people who have seen it.*

Activation

- **User action:** buy a ticket through our service. Using the coupon to swap a ticket with another user for free.
  - ○ **KPI**: *(PQL) rate between the number of people who will buy a ticket without additional costs and the number of subscribers who see the post.*
- **Facilitate user registration with quick and easy access options** (e.g., access via social media).
  - ○ **KPI**: *'Registration conversion rate'. This indicates the percentage of site visitors who complete the registration process.*
  - ○ **KPI**: *Average time to complete registration. This indicates how long, on average, it takes users to complete the registration process.*
  - ○ **KPI**: *Registration abandonment rate, which indicates the percentage of users who start the registration process but do not complete it.*

- **Offer incentives for the first transaction,** such as discounts or cashback.
  - ○ **KPI**: *Conversion rate for the first transaction. This indicates the percentage of new users who make their first transaction after receiving an incentive.*

- o **KPI:** *Cost per new customer acquisition (CAC), which measures how much it costs, on average, to acquire a new customer through these incentive offers.*

Retention

- **Sending e-mails or push notifications** about new events, exclusive offers, trending tickets, etc.
  - o **KPI***: E-mail open rate/push notification: The percentage of recipients who opened the e-mail or push notification. A high open rate can indicate that the message is relevant and attractive to your audience.*
  - o **KPI***: Click-through rate of e-mails/push notifications: This KPI measures the percentage of recipients who clicked on a link within the e-mail or push notification. A high click-through rate may indicate that the message effectively stimulated action on the part of users.*

Referral

- **Implement a referral programme** that offers existing customers incentives to bring in new users.
  - o **KPI**: *Number of completed referrals: This KPI measures the total number of new users who have enrolled through the referral program. A high number of completed referrals indicates that the referral program is effective.*
- **Incentivize users** to leave positive reviews on the platform.
  - o **KPI**: *Number of reviews left in relation to the number of purchases made.*

- **Offering discounts or benefits** to customers who share the app or service on their social channels.
  - o **KPI**: *The percentage of shares on social media that led to new registrations or purchases.*

Revenue

- **Commission per transaction:** Earn a commission for each ticket sold through platform. This commission can be charged to the buyer, the seller, or split between both.
  - o **KPI**: *Total revenue*

- **Value-added services:** Offer paid services such as ticket insurance, accommodation, or travel-related bookings, etc.
    - **KPI**: *the total revenue generated by value-added services.*
      o **Advertisement**: Generate advertising revenue by allowing related companies (such as transport companies, event organizers, etc.) to advertise on your platform.
    - **KPI**: *Total revenue generated by advertising.*

- **Market data:** Sell aggregated and anonymous data on user behaviors and market trends to interested third parties, always in compliance with privacy laws.
    - **KPI**: *Total revenue generated from the sale of market data.*

Figure 3 - SWOT Analysis

4.4 Market Strategy Customer segments

The start-up's market strategy focuses on four main customer segments:

1. **Individual users purchasing tickets for events or transport:** This group represents the platform's main user base. Individuals of all income brackets are included, as the platform offers a wide range of event and transport tickets of several types and costs.
2. **Users interested in purchasing tickets from individuals:** This segment includes individuals looking to purchase tickets for sold-out or reduced-price events. The

platform, with its cloud ticketing system and its secure and transparent marketplace, offers these users a reliable way to purchase tickets from individuals.

3. **Ticket distribution companies:** This group includes organizations that sell tickets for events or transport. The platform can offer these companies an additional sales channel, increasing their visibility and reaching a wider audience. This customer segment is intended to be reached at a later stage of application development.

4. **Event management companies:** This segment includes event organizers, promoters, and venues. The platform can offer these companies tools to manage ticket sales, access control, and fraud prevention. This customer segment is intended to be reached at a later stage of application development.

4.4.1 Distribution channels

Mobile application: It is intended to develop a user-friendly mobile application available for iOS and Android devices. This application allows users to buy, sell and store tickets securely, manage their digital tokens, and interact with the community. **Website:** In parallel to the application, you want to create a website optimized for desktop and mobile devices. The website provides detailed information about the start-up, its functionality, and services. In addition, it offers a secure portal for buying, selling, and storing tickets.

Integration with major social media: In the first future, the intention is to have a strong presence on major social media to engage and build user loyalty, promote its services, and provide an additional channel for service and support. By inserting links that act as a call to action to the website.

4.4.2 Customer relations

Online community: the aim is to develop a robust online community. This is done not only through the start-up's application and website but also through a strong social media presence. The aim is to create an environment where users can exchange experiences, advice and create discussions around the events and features of the platform. In addition, the start-up plans to collaborate with influencers in the entertainment and transport industries, which could help engage and grow the community. Collaborations could include Q&A sessions, social media takeovers, app feature reviews, etc.

Loyalty program: The aim is to create a loyalty program that rewards users for their active use of the platform and their participation in the community. This program is based on the use of digital tokens. In addition to the use of tokens as an incentive for transactions, the start-up also envisages a referral system. Users who invite friends and acquaintances to register and use the application receive additional tokens as a reward. This strategy not only encourages continued use of the platform but also facilitates its spread and growth.

4.4.3 Sources of Revenue

When drawing up Trust.io's revenue plan, two main sources of income must be considered: the transaction fee and the provider fee.

- **Transaction Fee:** This is the main monetization mechanism for Trust.io. For each ticket sold through the platform, Trust.io charges a 6% fee on the transaction amount. This is a common model for marketplace platforms and provides a predictable and scalable revenue stream. As the volume of transactions on the platform increases, the income generated by this fee increases proportionally.

- **Provider Fee:** This is a fee granted by the ticket issuer for each ticket sold through the Trust.io platform. The amount of fee is 1.10€ per ticket and applies to 70% of the total tickets sold. This represents a second important source of income for Trust.io, allowing the company to generate extra revenue from tickets sold.

To maximize income generation, Trust.io plans to implement additional income streams in the years to come:

- **Sale of advertising space:** The platform also could offer advertising space to third parties, providing another source of revenue. This could include event promotions, advertisements of ticket providers, or sponsorship of related brands. As the platform grows and acquires more users, advertising space will become increasingly valuable.

- **Token-based business model**: Tokenization is another important source of revenue. With the adoption of blockchain, the platform issues a native Algorand-based token, which can be bought, sold, staked, or used for transactions on the platform. This token not only serves as an incentive mechanism but can also generate revenue through its sale or exchange. Trust.io could implement a token-based business model. Tokens could be used to discount transaction fees, purchase tickets, or access exclusive content or events.

- **Aggregate Sale of Data:** Trust.io may aggregate and analyze user data anonymously to create insights into audience behavior, event trends, and more. This data could then be sold to third parties, such as event promoters, marketing agencies, and market research companies, always respecting privacy regulations.

On the basis of the aforementioned sources of revenue, according to the estimates made on the purchase estimates of the average user, starting from July 2024, there will be revenue of €76,000 in the first year, and with entry into the European market in 2025 market, it is expected to reach a total of €331,000. As brand awareness rises, ambitious growth is expected by 2027 to reach revenues of €8 million.

Figure 4 – Revenue for the next three years

Penetration and sustenance strategies, In the launch phase, the start-up might implement a market penetration strategy, offering reduced prices or special promotions to attract users. Once a solid user base has been established, the start-up might transition to a sustenance strategy, focusing efforts on retaining existing customers and expanding into new market segments or geographic areas. This transition could involve a gradual increase in fees or the introduction of new paid services.

4.4.4 Cost Structure

COGS – Cost of Goods Sold

In the context of a blockchain-based start-up such as Trust.io, it is crucial to consider the cost structure, which represents all the expenses that the company must incur in order to be

operational. These expenses include direct and indirect costs, the calculation and forecasting of which can be complicated due to the nature of the business.

The Cost of Goods Sold (COGS), represents the costs directly related to the production or provision of the services offered by Trust.io. In this case, Cloud costs are included. Data management, app, and site hosting, and all related services are outsourced, representing a crucial aspect of Trust.io's IT infrastructure. It is expected to cost 100€ per month by 2023, gradually increasing to 600€ per month by 2026. This progression is due to the expected expansion of the company and the increase in the volume of managed data, which leads to higher cloud costs. Another important aspect of COGS is the Web Marketing costs. These include app and site sponsorship through social channels, and payment for online advertising, known as Advertising (Ads). The marketing budget should reflect the need to reach a wide audience and build brand awareness. Various aspects are included in this cost item.

- **Online advertising:** Advertising on platforms such as Google, Facebook, and Instagram is an effective way to reach a large and diverse audience. These platforms allow audiences to be segmented according to various factors such as age, geographic location, and interests, enabling more efficient targeting.
- **SEO** (Search Engine Optimisation): A significant portion of online traffic comes from search engines. Optimizing your website for these search engines can improve your company's visibility and attract more visitors. This includes the use of paid SEO tools.
- **Collaborations and sponsorships:** Partnering with influencers and industry personalities can be an effective way to reach a wider audience. These partners can promote Trust.io to their followers, increasing the company's visibility and credibility.

As of 2024, Trust.io expects to incur translation costs. As the company expands into new markets, it will be essential to provide its service in different languages to ensure maximum accessibility for users.

In addition, in a second phase planned for 2024-2025, costs are expected related to the development of the token on Algorand, for the deployment of the smart contract. These costs may vary depending on the complexity of the smart contract, network fees at the time of deployment, and possible future changes to the smart contract itself.

Finally, it is important to consider API-related costs. Currently, Trust.io uses free APIs, but if requests exceed a certain limit, additional costs may be necessary. It is essential to include this possibility in the budget, so as not to jeopardize the company's operations.

Personnel costs – CAPEX

In the first years of operation, most of the resources are devoted to product creation and development. This is why we see the hiring of three developers during the first three years. Developers represent a significant, but crucial initial investment, not only for the development of the product but also for the ongoing maintenance and updating of the platform in response to market and customer needs.

It is important to note that costs related to product development are considered CAPEX (Capital Expenditures). This is because, although they represent an outlay of money, they contribute to the creation of a long-term asset, namely the platform itself, which will generate revenue for the company over time.

From 2025, the remuneration of several key figures will be included. In addition to the CEO (Chief Executive Officer), who is in charge of defining and implementing the company's strategy, we see the entry of the CTO (Chief Technology Officer), who will be in charge of technical supervision, the CMO (Chief Marketing Officer), responsible for marketing strategies, the CFO (Chief Financial Officer), who will manage the financial aspects, and the CCO (Chief Communication Officer), who will be in charge of communication and external relations with customers.

From the third year onwards, there is also the addition of a specialized sales team member. This person will have the task of promoting the platform to potential customers, thus generating new business opportunities.

It is to be noted that these are cost estimates and may vary depending on labour market conditions and the specific needs of the company. Furthermore, these costs only represent salary costs and do not include other personnel costs, such as social security and health benefits, training, equipment, and other benefits.

SGA - Selling, General, and Administrative Expenses

When designing the business model of a start-up like Trust.io, another essential component to be considered concerns the so-called Selling, General, and Administrative Expenses (SGA). SGA elements included in Trust.io's five-year plan include legal, accounting, and office costs.

- Legal: These costs are related to legal advice, contract reviews, regulatory compliance, and other legal issues the company may encounter. The estimated cost is €700 in 2023, €300 in 2024, and €500 in the following two years. The largest amount is expected in the first year as the company must incur formation expenses and due to the need to establish basic legal agreements for the operation of the start-up.
- Accounting: These costs relate to accounting services, such as bookkeeping, preparation of tax returns, and financial advice. The expected cost is EUR 200 in 2023 and 2024, increasing to EUR 400 in 2025 and 2026. The expected increase is attributed to the increasing complexity of the company's financial operations and the need for more in-depth advice because of business expansion.
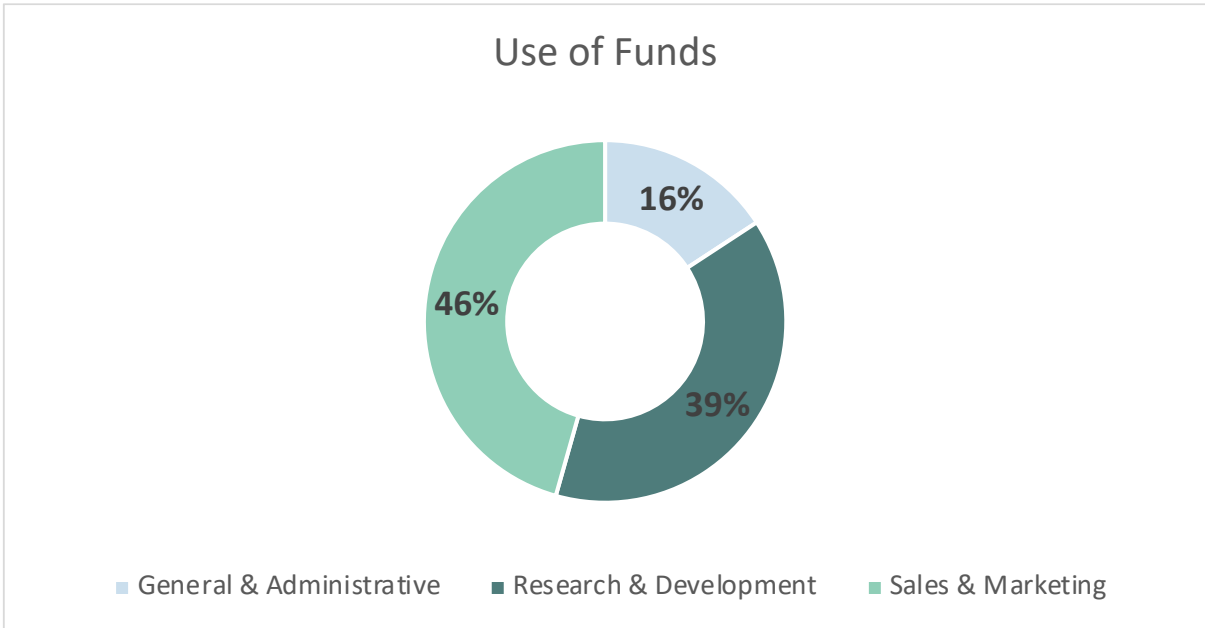

Figure 5 - Use of Funds

4.5 Value proposition, resources, and key activities

Value proposition

Trust.io's value proposition is the ability to provide a secure and transparent experience for the purchase, sale, and resale of event tickets. The use of blockchain technology allows the

origin and history of each ticket to be tracked, eliminating the possibility of fraud, and assuring buyers that the ticket they are purchasing is authentic. In addition, the platform provides the ability to resell tickets in a secure and compliant manner, offering a solution to the problems of unused tickets or events that can no longer be attended.

Key Resources

Key resources for Trust.io include the blockchain technology, the development and management team, the user base, and strategic partners.

- **Scalable** and secure technology platform: At the heart of the start-up is a scalable and secure technology platform, a key element for the functioning of the service offered. Relying on the Algorand blockchain, the platform can handle up to 1,000 transactions per second, a capacity that allows it to cope smoothly with periods of high demand, always ensuring a reliable service. Interoperability with other blockchain platforms adds a further level of flexibility and openness, making the service even more useful and convenient for users.
- **IT security and data protection:** Protecting user data is a priority for the start-up. Using state-of-the-art security measures, such as encryption of sensitive data and two-factor authentication, along with a strict GDPR-compliant data management protocol, the platform ensures that user information is always protected.
- **Engaging and customized user** experience**:** The start-up is committed to offering a unique user experience. The user-friendly interface and the ability to customize preferences make using the platform intuitive and enjoyable.

Key activities

- **Platform Development and Maintenance**: This includes coding, testing, debugging and continuously updating the platform to ensure that it is secure, efficient, and user-friendly. It also includes the development of new features to improve the user experience and respond to market needs.
- **Marketing and User Engagement:** This activity includes promoting the platform, attracting new users, and maintaining the engagement of existing users through marketing campaigns, social media, excellent customer service, exclusive offers, and incentives through tokens.

- **Partnership Management**: It is important to establish and manage relationships with strategic partners, such as event promoters and ticket platforms, to ensure the constant availability of tickets on the platform and to increase its visibility in the market.

4.6 Strategic partnerships, marketing plan, and business strategies

Strategic partnerships, marketing plans, and commercial strategies are key elements for the success of Trust.io. Forming alliances with key players can improve the visibility of the platform, increase user trust, and create synergies that can accelerate growth. Having a solid marketing plan to attract and retain users and a business strategy that aims to maximize revenue are key to creating a sustainable business model.

Strategic partnerships

Collaborating with key players in the events and transport sector could lead to mutual benefits and a stronger market position.

- **Event Organizers:** Trust.io could form partnerships with event organizers, concerts, shows, and fairs. This could facilitate access to a large inventory of tickets, thus increasing the variety of events available on the platform. In addition, event organizers could benefit from the security and transparency offered by Trust.io's blockchain.
- **Existing Ticketing Platforms:** By partnering with already established ticketing platforms, Trust.io could integrate its innovative blockchain service into its existing operations. This could not only expand Trust.io's reach, but also offer existing platforms an additional tool to combat illicit resale and ticket fraud.
- **Companies offering complementary services** (e.g., catering or accommodation)**:** A second line of development is to create synergies with companies offering complementary services, such as catering or accommodation. This could make it possible to offer complete packages to users, increasing the perceived value of the service and creating new monetization opportunities. An integrated service would be offered that facilitates the user experience, from the purchase of the ticket to the stay and travel.

Marketing plan:

Trust.io's marketing plan focuses on creating a strong presence in the digital marketplace, educating the public on blockchain technology, establishing a trusting relationship with users, and creating an active social media community.

- **Digital Marketing:** Trust.io will focus strongly on SEO (Search Engine Optimisation) and SEM (Search Engine Marketing) to ensure optimal visibility in search engines. Social media and email marketing campaigns will be used to reach the target audience, inform users about the latest events, and promote the use of the platform.
- **Social Media Presence:** Trust.io plans to have an active and engaging presence on major social media. This will not only help reach a wider audience but also create a community of users and fans who can become brand ambassadors.
- **The trust of Users:** Trust.io will actively work to establish a relationship of trust with its users. It will make use of user reviews and testimonials, ensure excellent customer service, and provide clear and transparent information on how user data is handled.

Business strategies

Trust.io's business strategies aim to generate sustainable and scalable growth over time.

- **User loyalty and engagement:** To build a loyal and active user base, Trust.io envisages several engagement strategies, such as a referral program, a token-based incentive system, and an engaging and personalized user experience. Active user involvement will be crucial for the long-term development and success of Trust.io. This includes a referral program that rewards users for bringing new members to the platform, the awarding of tokens as an incentive for using the platform, and an active social media presence to reach a wider audience. In addition, the start-up will explore potential partnerships with influencers and other key industry players to increase the platform's visibility and credibility.

- **Freemium model:** Trust.io will follow a freemium business model. Users will have access to basic features for free, while advanced features (such as VIP packages, and commission-free sales) will be available through a premium subscription. This attracts a wide audience of users and, at the same time, generates revenue from those who choose to upgrade.

- **Commission on transactions:** Trust.io will earn a commission on every ticket transaction on the platform. This will ensure a constant source of income that will increase as the volume of transactions grows.
- **Tokenization**: Trust.io plans to implement a system of native tokens that can be earned and spent on the platform. This not only encourages user participation but could also generate additional revenue through the sale of tokens.

4.7 Implementation and Future Key Challenges and Opportunities

The main **key challenges** facing the platform both in the initial stages and in the early future are several, among the main ones we find:

- **Regulation and legal compliance**: Compliance with privacy laws, financial transaction regulations, and local laws relating to ticket sales can be a major challenge. Time and resources will need to be invested to ensure full compliance with all relevant laws.
- **Competition:** The market for online ticket buying and selling platforms is competitive, with several established players such as Ticketswap and PayPal. It will be necessary to differentiate itself and convince users to choose its platform over existing alternatives.
- **User trust:** Gaining the trust of users can be difficult, especially as the startup aims to solve the problem of online scams. It will need to prove its reliability and security to attract and retain users.
- **Scalability:** While the start-up starts by operating nationwide, future expansion may present challenges in terms of managing growth, maintaining service quality, and adapting to local regulations.

Opportunities

- **Growing digitisation: The** adoption of digital services is growing steadily, and this trend may favor the adoption of the platform by users.
- **Innovation in the ticket industry: The** startup's **approach**, which combines the sale, exchange, and secure storage of tickets in the cloud, may represent a significant innovation in the ticket industry.
- **Improved user experience:** The use of tokens as incentives can improve the user experience and promote positive behaviour, creating a safer and more trustworthy online environment for buying and selling tickets.

4.7.1 Roadmap and implementation plan

Project Phases and Milestones: The project will follow a well-defined roadmap. It will begin with the development of a Minimum Validated Product (MVP) to test the market response and gather feedback the development of a landing page for the site, and the creation of social channels for brand awareness.

Next steps will include the integration of SPID technology to improve transaction security and the expansion of partnerships with event organizers and transport service providers.

- **Conception** Phase**:** This phase concerns the definition of the idea, market research and validation of the concept.
- **Design Phase:** In this phase, the business model will be developed, and the technical specifications of the platform will be defined.
- **Development** Phase**:** This phase involves the development of the valid minimal product (MVP) and the integration of the Algorand blockchain.
- **Launch Phase:** After testing and finalization of the MVP, the product will be launched on the market.
- **Growth Phase:** In this phase, it is planned to expand the platform, establish further partnerships, and integrate new functionalities, such as integration with SPID.

Trust.io currently is in the middle of the Conception and Design Phase, as this start-up is being proposed at the Dock3 - The Start-Up Lab, where the idea is being designed with the help of mentors and a team of experts. The MVP phase for the final presentation to investors is being pursued.

Financing

To finance the development and growth of the platform, venture capital or business angel investments are envisaged. These investors provide capital in exchange for an equity stake in the company. The choice between venture capital and business angels will depend on various factors, including the stage of development of the project, the amount of financing required, and the conditions offered by the investors. In general, business angels tend to invest at earlier stages and offer smaller amounts of funding, whereas venture capitalists invest at more advanced stages and can provide more significant funding. Both also offer the opportunity to benefit from their network, experience, and expertise.

Funding is a key element in the development and growth of Trust.io. The platform aims to attract investors such as venture capitalists or business angels, who can provide the necessary funds to expand the business and take the product to the next level. Given Trust.io's innovative character and ambition to revolutionize the ticket market, venture capital may be the most appropriate financing option. This is because venture capitalists tend to invest in companies that have the potential to scale quickly and reach a large market, like Trust.io.

Venture capitalists can also offer more significant investments that can support Trust.io's rapid growth and its goal of scalability. In addition, they can provide a network of industry-specific contacts and expertise that can help Trust.io overcome market challenges. The aim is to fill clearly defined needs through certain characteristics:

- **Technical and industry expertise:** As a blockchain-based start-up, Trust.io could benefit from investors who have a deep understanding of this technology and the ticket market.
- **Network of contacts:** investors with an extensive network of contacts in the technology and entertainment sector could help Trust.io form strategic partnerships and acquire customers.
- **Strategic and managerial support:** As a start-up, Trust.io could benefit from the strategic and managerial support of experienced investors who can provide advice on company growth, market penetration, and challenge management.

Given the background of the people behind the application, it is believed that a starting point is to join university-backed acceleration programs, such as *LVenture, Bocconi4Innovation,* etc... and the same path is being pursued with the University of Rome 3 (Dock 3 - The start-up lab).

4.7.2 Future Developments and Opportunities

Application development: In the long term, it is planned to expand the functionality of the application to offer an increasingly comprehensive and customized service. This could include the possibility of purchasing complete packages including event tickets and transport or accommodation services. Potentially the integration with installment systems (Ex: Scala pay) to make the application increasingly attractive.

Technology transfer is a process by which a technology, skill, knowledge, or expertise developed in one organization is used in another organization or sector to create new products, processes, or services. In the case of Trust.io, the high scalability of the technology, which is based on blockchain, smart contracts, and advanced security protocols, makes it potentially useful in multiple contexts beyond ticket sales and resale. It could be used, for example, to ensure the traceability and authenticity of a variety of products and services, or to facilitate secure and transparent transactions across a range of sectors, for example, a related business diversification could be the expansion and replication of these services within the hotel market. Technology transfer could take place through the formation of partnerships with other organizations or sectors that could benefit from the application of Trust.io's technology. This could open new business opportunities for the startup, contribute to the dissemination and development of blockchain technology, and create value for a variety of stakeholders.

4.7.3 Legal approaches, GDPR, etc. Immutability of Blockchain information

Creating an application that handles the buying and selling of tickets on a blockchain platform entails several legal considerations. For instance, the implementation of blockchain may have significant implications for data protection and GDPR.

- **Immutability:** The key feature of blockchain is the immutability of data, i.e., once a piece of data is entered into the blockchain, it cannot be changed or deleted. This can conflict with the 'right to be forgotten' under the GDPR, which allows individuals to request the deletion of their personal data.[92] The right to be forgotten, or right to erasure, is a key principle of the GDPR (Article 17). It allows individuals to request the deletion of their data when there are no legitimate grounds for continuing to process it. This can include situations where the data is no longer needed for the purpose for which it was collected, or the individual withdraws their consent to the processing of the data. However, the blockchain is designed to be immutable, which means that once data is written to the blockchain, it cannot be changed or deleted. This creates an apparent conflict with the GDPR's right to be forgotten. Here are some implications:
    - **Limiting personal data on the blockchain:** One possible solution could be to limit the amount of personal data that is written on the blockchain. For example,

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[92] "The Right to be Forgotten: A Closer Look at GDPR's Article 17" n.d., https://www.hgcattorneys.com/post/the-right-to-be-forgotten-a-closer-look-at-gdpr-s-article-17.

instead of storing personal data directly on the blockchain, it might be possible to store only references or hashes of such data. The actual personal data could be stored off-chain and could then be deleted if necessary.

- o **Private blockchain vs. public blockchain:** private blockchains, controlled by specific entities, may have more flexibility to handle data deletion requests than public blockchains.

- **Data transfer outside the EU:** If the blockchain is global, data may be transferred outside the EU. This can be problematic, as the GDPR imposes restrictions on transfers of personal data outside the EU. One strategy to mitigate this implication is to store the most sensitive personal data off-chain, in a centralized database located within the EU. Only references to this data (such as hashes) would be stored on the blockchain. In this way, even if the blockchain data were transferred outside the EU, the sensitive personal data would remain within the EU.

- **Privacy regulation:** The application of privacy regulations, such as the General Data Protection Regulation (GDPR), entails the need to obtain the explicit consent of users for the processing of their data (Article 7 of the GDPR), in addition to ensuring data security (Article 32 of the GDPR). Furthermore, the GDPR recognises the right of users to access, rectify and delete their data (Articles 15, 16, and 17 of the GDPR). To meet these requirements, a system will be implemented that requires the explicit consent of users, the use of techniques such as pseudonymization to protect the identity of users (considering the Article 29 GDPR guidelines), and the development of a process to handle users' requests in relation to their personal data. As well as the implementation of data protection by design and by default[93].

Another legal implication to be considered is the legislation pertaining to the regulation of the secondary market. Based on the reference legislation - Article 1, paragraph 545, of Law No. 232 of 11 December 2016 - and on the new decree-law published in March 2023, which follows the EU Directive 2019/2161 c.d., Trust.io does not incur the legal issues related to selling in the secondary market because it acts as an intermediary between users, not selling tickets directly. The activity is in line with Article 1(545) of Law No. 232 of 11 December 2016 and EU

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[93] "Art. 25 GDPR - Data protection by design and by default - GDPR.eu" n.d., https://gdpr.eu/article-25-data-protection-by-design/.

Directive 2019/2161, the 'Omnibus Directive', implemented in Italy in March 2023[94], which strengthens consumer protection and harmonizes sanctions within the EU. This positioning helps to ensure greater protection for platform users.

4.8 Sustainability and governance Stakeholder involvement

Identifying and involving key stakeholders is crucial to the success of the start-up. Stakeholders include not only investors, but also customers, partners, employees, and the community at large.

1. **End users**: These are the customers who use the platform to buy, sell or exchange tickets. Their experience with the platform and their feedback are crucial for product development and continuous improvement. The challenge is to maintain a high level of customer satisfaction and involvement. It is intended to engage them through an unprecedented user experience, unique incentives through tokens and opportunities for community interaction.

2. **Service providers: These include event organizers**, transport service providers, and companies offering complementary services such as catering or accommodation. Relationships with these partners are crucial for the delivery of the services offered by the platform. There may be challenges in negotiating profitable agreements and maintaining long-term relationships.

3. **Investors:** Investors provide the capital needed to grow the start-up. Their commitment is often linked to the financial performance of the startup and its ability to scale. The challenge here is to ensure a return on investment and to manage investors' expectations.

4. **Regulators**: Since the start-up operates in the ticketing industry and uses blockchain technology, it may be subject to specific regulations. The challenge is to maintain compliance with applicable laws and regulations by engaging in an open and constructive dialogue, with the aim of promoting a fair and transparent ticketing ecosystem.

5. **Employees**: Employees are a fundamental part of the organisation, and their commitment is essential to the success of the company. The challenge is to attract and retain talent that believes in the values and the project, ensuring a positive and

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[94] https://codacons.it/consumatori-saldi-siti-di-comparazione-recensioni-online-e-secondary-ticketing-ecco-tutte-le- novità-del-decreto-approvato-dal-governo/

motivating working environment, and promoting training and professional development.

Stakeholder engagement according to the quintuple helix model

The quintuple helix model represents an innovative approach to governance, which considers five different stakeholder groups: universities (or research institutions), industry, government, environment, and civil society. This model offers an effective framework to engage all stakeholders in an open and constructive dialogue.

- **Universities/Research Institutions: A** point of prestige and a breeding ground for ideas and initiatives is the collaboration with research institutions and universities to stay at the forefront of blockchain technology development and cybersecurity best practices. This involvement can include joint research programmes, internships for students.

- **Industry:** The start-up aims to work closely with industry partners, including event organisers, transport service providers and online payment platforms. The goal is to create a robust ecosystem that fosters growth for all stakeholders.

- **Government:** A constructive dialogue with government authorities is crucial to ensure compliance with evolving regulations on e-commerce, data privacy and blockchain. The start-up can also seek to influence public policy to promote a fairer and more transparent secondary ticket market.

- **Environment:** Although the start-up has no direct impact on the natural environment, it is committed to minimising its ecological footprint, for example, by reducing paper use through e-tickets.

- **Civil Society:** The users of the platform are at the centre of everything the start-up does. Besides offering a quality service, the start-up aims to involve users in building an active community and a fairer secondary ticket market.
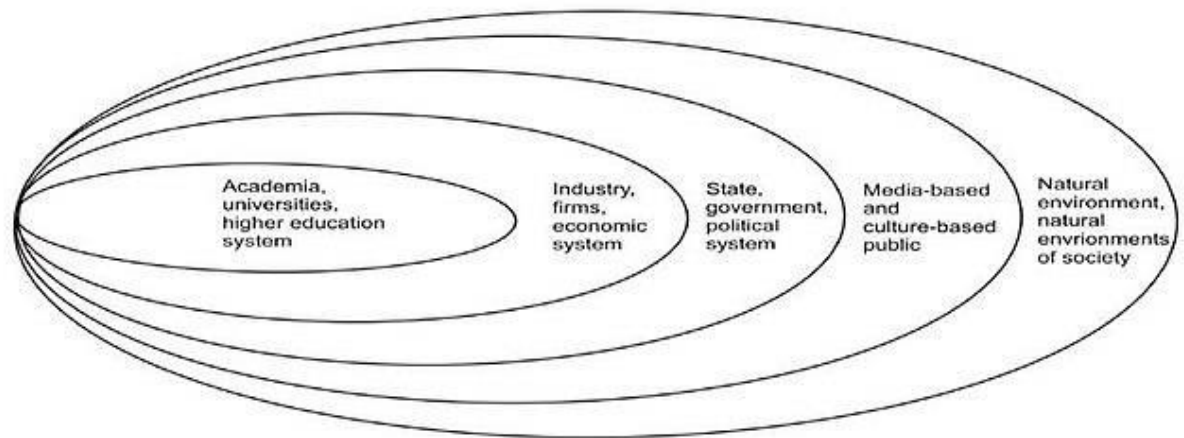
Figures 5 - Quintuple Helix model

4.8.1 Sustainable governance model:

The start-up intends to implement a sustainable governance model, including careful management of resources, both human and financial, and a commitment to long-term value creation.

In line with the UN Sustainable Development Goals, Trust.io is committed to promoting innovation and quality infrastructure (Goal 9), through the implementation of blockchain technology, and to ensuring sustainable consumption and production practices (Goal 12), through the promotion of a fair and transparent secondary ticket market.

The governance model also includes the promotion of an inclusive and respectful working environment to ensure gender equality (Goal 5) and decent work and economic growth (Goal 8).

Challenges in achieving these goals include the widespread adoption of blockchain technology, regulating the secondary ticket market and managing stakeholder expectations. However, opportunities include access to a new generation of digital consumers, the ability to reduce ticket fraud and the ability to create a new standard for the ticketing industry. The acronym ESG refers to three fundamental dimensions of sustainability and corporate responsibility: Environmental (Environmental), Social (Social) and Governance (Governance). These criteria are increasingly important to investors, who see them as an indicator of a company's long-term responsibility and sustainability. How they are to be applied is explained below:

- **Environment (Environmental):** Although the start-up operates in the digital sector and has no direct impact on the natural environment, it is committed to minimising its ecological footprint. This includes using an energy-efficient blockchain protocol such as Algorand, promoting digital tickets to reduce paper usage, and using green or energy-efficient servers and IT infrastructure for its cloud service. In particular, by adopting a Pure Proof-of-Stake (PPoS) consensus algorithm protocol, unlike PoW, PPoS does not require nodes to solve complex mathematical problems, which means it requires much less energy. This shows customers and investors that you are aware of the environmental problems and are committed to being part of the solution. This can help the start-up stand out in an increasingly environmentally conscious market and attract investors who value ESG criteria.
- **Social:** One aims to create a positive impact on society. This includes the promotion of a fairer and more transparent secondary ticket market, the active involvement of users in community building, and the creation of economic opportunities through its business model.
- **Governance:** It is intended to pursue clear and transparent governance principles. This includes a clear division of roles and responsibilities among management, accountability of management to shareholders and stakeholders, transparency in business operations, and compliance with laws and regulations, including GDPR. Furthermore, the start-up is committed to preventing any form of corruption or unethical behaviour.

Together, these ESG initiatives help create a sustainable governance model that aligns start-ups with the UN Sustainable Development Goals and makes them attractive to responsible investors.

Conclusions

The present thesis "Trust.io: Can a Start-up Based on Blockchain Help to Solve the Information Asymmetry in C2C Markets?" conducted an in-depth and multifaceted investigation into the interaction between blockchain technology and C2C markets, highlighting how an innovative start-up can address and potentially solve the problem of information asymmetry.

The path of analysis undertaken began with an exploration of the state of the art, through which the complex and multifaceted picture of information asymmetry and moral hazard in C2C markets was outlined. Moving across the informal and digital domains, it highlighted the importance of aggregation platforms and outlined the unexpressed promise of blockchain technology to revolutionize these dynamics.

At the heart of the investigation stands Trust.io, a start-up whose business model is based on blockchain. The first 100% secure ticket aggregation platform. The analysis highlighted how Trust.io, with its native token on Algorand and cloud ticketing service can embody a revolutionary approach in the C2C landscape, helping to create a fairer, more transparent, and secure marketplace.

The opportunities of Trust.io were further explored through an exhaustive market analysis. A fertile environment for Trust.io's growth and expansion were identified, based on accurate market segmentation, considered position analysis and a careful assessment of market size and trends.

Looking ahead, the challenges and opportunities for Trust.io were considered. Among operational, legal, and strategic considerations, we highlighted the potential for further development, the implications of GDPR and the immutability of blockchain information, and the importance of a sustainable governance model for long-term success.

The thesis demonstrated that Trust.io, through the innovative and thoughtful application of blockchain technology, has the potential to not only address but significantly solve the problem of information asymmetry in C2C markets. The path outlined for Trust.io, if followed carefully and rigorously, can lead to a radical change in C2C market dynamics, bringing tangible benefits to both individual consumers and the market as a whole. This thesis, therefore, not only contributes to a rapidly evolving field of study but also illuminates a
practical and promising path to a fairer and more transparent future in the context of C2C markets.

Moreover, Trust.io's approach of integrating close collaboration with stakeholders and a sustainable governance model is an example of how companies can combine technological innovation and social responsibility.

Furthermore, Trust.io's approach, which integrates close cooperation with stakeholders and a sustainable governance model, is an example of how companies can combine technological innovation and social responsibility. This is particularly important in the current context, where consumer trust is increasingly becoming a key success factor for companies.

Based on what has been analyzed, it is possible to say that Trust.io represents not only a response to the current problems of C2C markets but also a vision of what the future of these markets could be. A future in which information asymmetry is greatly reduced, in which consumers can make more informed choices, and in which transactions take place in a more secure and transparent environment.

The conclusion of this study does not mark the end, but the beginning of a broader path of research and experimentation. Blockchain, as we have seen, offers unexplored possibilities that can revolutionize various sectors and markets. Trust.io is just one example of how this technology can be used to create innovative solutions and solve complex problems. It is hoped that this work will provide a solid basis for further research and experimentation in this promising field.

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Annex A – Business Plan

BP_630963_Eleon
ora Ruggeri.xlsx

Annex B – Pitch for Dock3-The Start-up Lab & Lazio Start-up Cup

Today we want to start with some questions. How many times have you had the desire to go to the concert of your favorite singer who comes to Italy once every five years? And how many times has this happened to you?

Your ticket goes out on 27 June at 10:00 am, it is 9:59 am and you are sitting in front of your desk with your laptop plugged in, your IPad on the right, and your phone on the left. It's finally time, it's 10 am, and you immediately click to refresh the ticket one page and you find this.

You are the 104,206 people in the queue. You keep trying for the next twenty minutes but can't manage to grab one of the tickets. So, what do you do? you start googling for tickets and

End up seeing your dream ticket costing one thousand times as much. You refuse to pay so much, you spend the following months searching, you find the ticket you were looking for, after three months of searching, and then you proceed with the payment on PayPal, and then, this happens:

You are SCAMMED.
Like so many people here, there is no platform that allows you to be 100% sure that you can buy and sell any ticket. That is why we present to you.

Don't worry because we have created Trust.io.

Trust.io - Empowering trust in every trade.

We are the first ticket aggregator platform that allows you to purchase event tickets through our platform directly from merchants in total security and resell them to other users in a completely safe C2C market.
You will receive your ticket only a few hours before the event, in this way, you can put it on sale through our platform at any time. We will keep the ticket in the cloud, and only the last buyer who decides to redeem it will receive it. IN ORDER TO GUARANTEE SAFETY

None of our competitors reaches our level of Security and Transversality in this sector.

Trust.io operates in a market of ticket concerts that has a SOM o 1,36 billion in revenue in 2023 alone, with a CAGR of 3,43%.

We pre-launched our web platform and go live on social media, reaching 1-month xxxx impression visitors and subscriptions. We expect to go live with the app by August and be able to sell 3000 tickets within the year and 10k tickets exactly one year from now.
To do this we need 170k allocated mainly to Research and Development and Sales and Marketing.

We are Davide, Gianluca, Ludovica, Bruno, and Eleonora, and we are here to make your desire to go to concerts come true.
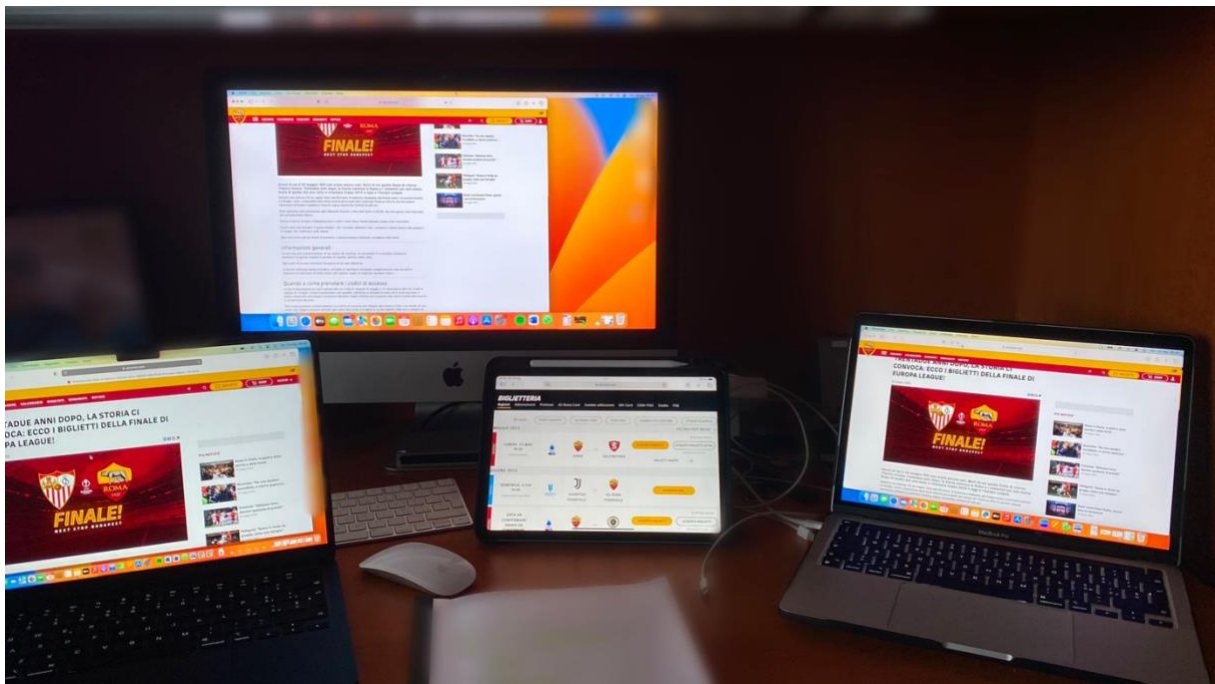
Feel free to contact us.

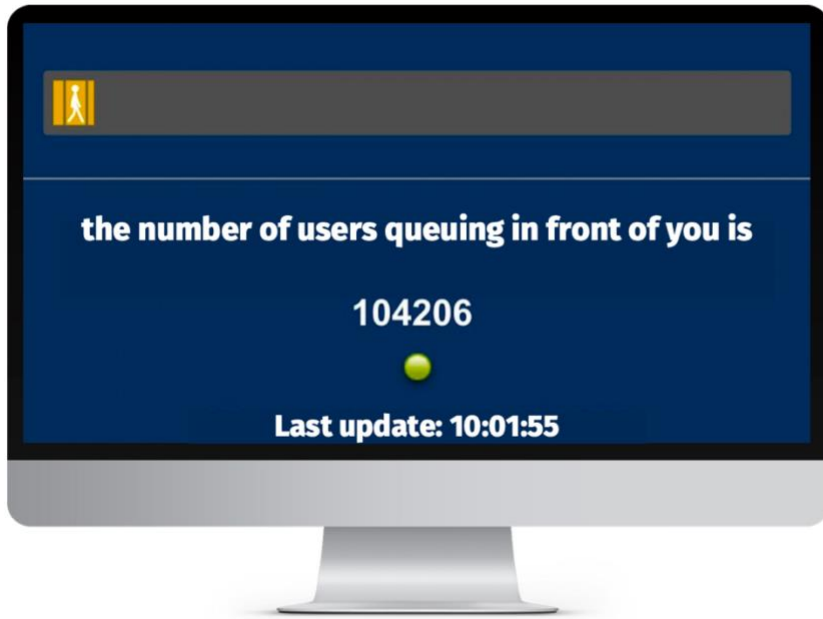**Annex C – Presentation for Dock3-The Start-up lab & Lazio Start-up Cup**

NO MORE SCAMS!

ENJOY YOUR FAVOURITE EVENTS

Eleonora Ruggeri
CEO

Trust.io

the number of users queuing in front of you is

104206

Last update: 10:01:55

Tickets Coldplay

Trova i biglietti per **Coldplay** che stai cercando su viagogo, il mercato virtuale più grande al mondo di compravendita di biglietti. Seleziona un evento per visualizzare i biglietti disponibili, oppure prova ad aprire il calendario per vedere tutte le date per cui sono ancora in vendita dei posti. Inoltre, potrai anche vendere eventuali biglietti in più per Coldplay direttamente su viagogo: puoi pubblicare il relativo annuncio gratuitamente. Tutti i biglietti per Coldplay sono coperti dalla garanzia sui biglietti viagogo!

♪ ♪ *Clocks* ♪ ♪

lun 03 lug 2017 20:50 🔥 C'è molta richiesta!	🇮🇹 **Milano, Italia** San Siro Coldplay 🔥 Solo 24 rimanenti sul nostro sito!	Da **€ 228,00** A **€ 5.800,00** Vedi i biglietti
mar 04 lug 2017 20:50 🔥 C'è molta richiesta!	🇮🇹 **Milano, Italia** San Siro Coldplay	Da **€ 192,00** A **€ 3.500,00** I biglietti più economici a Milano! Vedi i biglietti
sab 03 dic 2016 19:00	📍 **Penrose, Nuova Zelanda** Mt Smart Coldplay	Da **€ 105,00** A **€ 449,00** Vedi i biglietti
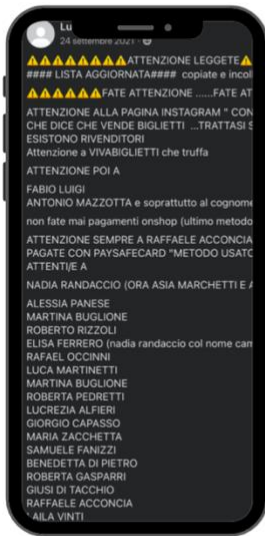
Trust.io

EMPOWERING TRUST IN EVERY TRADE.

HOW DOES IT WORK?

Browse and search your favourite event

Buy the ticket directly from the ticket issuer

Resell the Tickets

OR

Redeem the ticket and enjoy the event

Trust.io

COMPETITOR

Security

Trust.io

fanSALE

viagogo

ticketswap

PayPal

MarketPlace

Trasversality

MARKET

TAM ········· Sport and concert events Worldwide ········○ **78,27 bn**

SAM ········· Sport and concert events Europe ········○ **12,42 bn**

SOM ········· Sport and concert events Italy ········○ **1,36 bn**
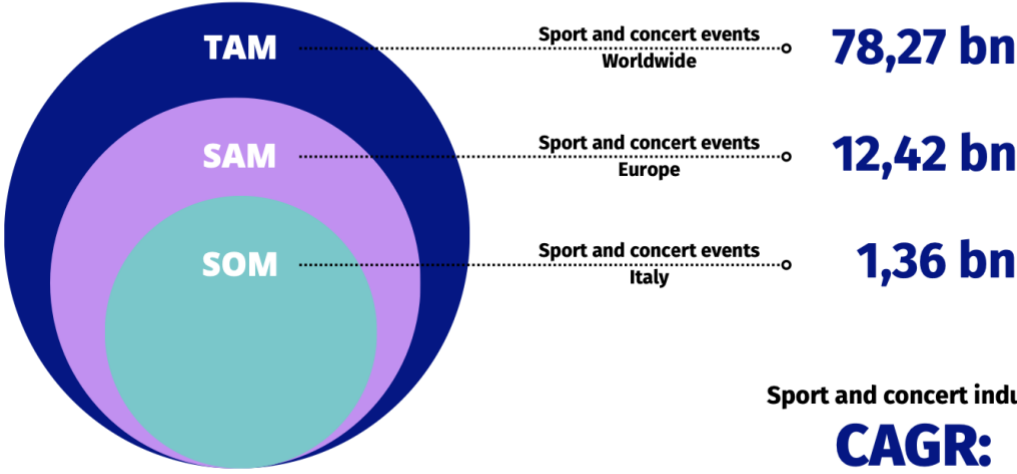
Source: Statista 2023

Sport and concert industry
CAGR:
3,43%

TRACTION

6000 impression on Instagram

3000 web site visitors

1000 Form subscription

Trust.io

ROADMAP

August
Go Live

January 2024
3K tickets sold

March 2024
Partnership with
events sector

May 2024
32k tickets sold

"Empowering trust in every trade"

Trust.io

REVENUE MODEL
We have two main revenue sources

FEES

We charge a 6% commission every time our users buy tickets.

$

PROVIDER FEES

For each ticket sold we receive a commission of 1.10€ from the ticket issuer

	32.0000 tickets sold	X	6%
+			
	24.000 Provider fees	X	1.10€

€93.600 Revenue*

*expected by May 2024

Trust.io

OUR TEAM

Ludovica Fogù
CMO

Marketing Student
and experienced
Campaign manager

Davide Bazzana
CTO

Front-end software
engineer

Eleonora Ruggeri
CEO

Business student
and Project
manager

Bruno Ramaccia
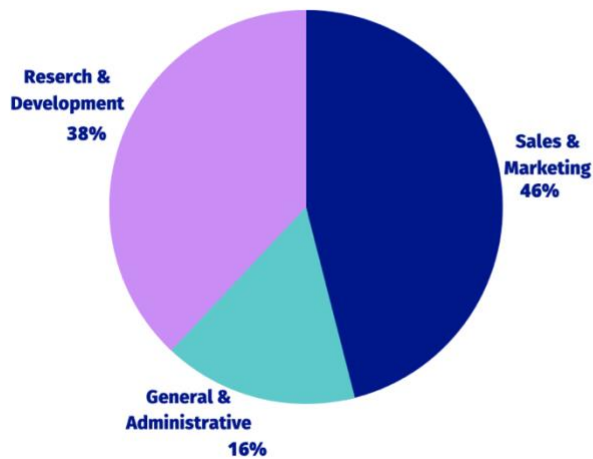**CCO**

Consultant and
professional
former

Gianluca Peconi
CFO

Economics
student and
Financial analyst

Trust.io

FINANCIAL NEEDS

Reserch &
Development
38%

Sales &
Marketing
46%

General &
Administrative
16%

€ 170K

Trust.io

Thank You!

EMPOWERING TRUST IN EVERY TRADE.

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Trust.io

Summary

Introduction

The thesis "Trust.io: Can a Start-up Based on Blockchain Help to Solve the Information Asymmetry in C2C Markets?" Examines in depth the interaction between blockchain technology and C2C markets, highlighting how an innovative start-up can address and potentially solve the problem of information asymmetry. The implementation of blockchain technology in the secondary ticket sales industry is discussed, focusing on a start-up called Trust.io. Digital commerce is an increasingly significant part of the global economy, with steady growth over the past two decades. However, the buying and selling of digital goods between individuals, known as the C2C market, still presents some challenges related to information asymmetry. This can lead to problems of fraud, lack of trust between market participants and difficulties in fair transactions. In 2008, Bitcoin's Whitepaper outlined the concept of a decentralized digital currency based on a peer-to-peer network and protected by cryptography. Blockchain is a digital ledger technology that enables the creation of a decentralized, secure, and transparent ledger of transactions. This technology has gained considerable recognition in this sector of the economy due to its inherent characteristics, such as its ability to facilitate and manage digital transactions with a high level of security and transparency. Trust.io is a start-up that aims to solve the problem of fraudulent online buying and selling of event and transport tickets between individuals. The goal is to eliminate

information asymmetry barriers in the buying and selling of digital by using blockchain technology to ensure transparency and trustworthiness of transactions. The incentive for users to use the platform is through the distribution of small percentages of tokens each time a transaction is made.

The scientific rationale behind this type of remuneration is provided by the Nudge theory, which suggests that small incentives can have a significant impact on people's behavior. The fair distribution of small amounts of tokens can push users to use the platform more frequently or intensively, even if the number of tokens is relatively insignificant. Tokenomics is a business model that uses cryptocurrencies or tokens as a form of value to incentivize user participation in a platform. It defines two aspects of a crypto economy: the incentives that determine how a token is distributed and the utility of tokens, which influences the demand for them. Developers have many variables at their disposal to influence various aspects of their project's Tokenomics, such as mining and staking. Historical blockchains such as Bitcoin and Ethereum 1.0 release cryptocurrencies to incentivize miners to validate transactions. In proof-of-stake (PoS) blockchains, rewards go to those who have locked a certain number of coins in a smart contract. Going deeper in the problem of information asymmetry has been widely studied in economics and arises when one party to a transaction possesses more complete information than the other, resulting in a negotiating advantage. It can cause several problems, including the disappearance of efficient transactions and higher prices for buyers.

The approach used in business model drafting is to use the sustainable governance model approach, i.e. to pursue a sustainable strategy that enables the company to create value for its shareholders while contributing to a sustainable society. Governance models (i.e. organization and management) are based on the principles of sustainability, which means considering the impact of decisions and actions in the long term, as well as financial and short-term results. The adoption of sustainable practices can increase a company's transparency towards its customers, creating a climate of trust and transparency, protecting personal data and improving reputation. This can increase trust among market participants and foster the development of new business models. The most appropriate core technology for this type of service is Algorand, which has a high throughput and low transaction cost. Furthermore, it is considered more appropriate to adopt a Proof-of-Stake (PoS) mechanism to ensure greater decentralization and security.

The research question that provided the input for the creation of this start-up is: How can blockchain technology be a vehicle for solving information asymmetry in the C2C market for

digital objects? To answer the question, a qualitative research methodology based on case analysis and a review of existing academic literature is used. The objective of the thesis is to propose a technological solution that eliminates information asymmetry in the C2C market for digital items, with the added value of a multi-disciplinary approach touching on economic, governance, fintech, and legal aspects impacted. In the following chapters, the various aspects of the proposed solution will be touched upon analyzing scenarios, technology transfer, stakeholder engagement, and sustainable governance models. Additionally, a business plan of the proposed solution will be presented, in which a detailed description of the platform, a cost-benefit analysis, and an assessment of potential challenges and limitations will be provided.

Current state of the art

According to research by Statista, the C2C market recorded over 2.14 billion digital transactions worldwide in 2021, with a forecast to reach 2.52 billion by 2024. The use of blockchain technology may be a promising solution to these problems. The current market conditions have made buyers and sellers less inclined to trade, as they cannot be sure of the reliability of the sellers and the products they buy. To solve these problems, it may be necessary to introduce a system that ensures transparency and security of transactions between private individuals online. Blockchain technology could be a solution, as it enables the creation of immutable and secure records of transactions, guaranteeing the authenticity and integrity of data.

Information asymmetry can lead to" Lemon" markets where inferior products dominate. Digitized markets can create information asymmetries due to limited access to data, as in the case of Google and Facebook, which have access to huge amounts of consumer data. Meta's main activity is to sell users access to the News Feed, which is used to show specific third-party ads. However, consumers may find it difficult to assess the quality of the products and services offered, as they do not have access to complete and accurate information. Signal theory suggests that one party can send a credible signal to the other to communicate valuable information. Also to be considered is Moral hazard, which is the risk that a party has not entered into a contract in good faith or has provided misleading information about its assets, liabilities or creditworthiness. It can occur in various situations, such as in insurance contracts, where the insured may not take the necessary precautions to avoid the risk. To reduce the risk of misconduct and improve trust between the parties involved, control tools such as reputation systems or independent verification systems can be used.

The article 'The Effect of Reputation to the Moral Hazard in C2C E-Markets with Game Theory' studies the impact of reputation on moral hazard management in peer-to-peer (C2C) e-commerce markets. The research results show that the effect of reputation on moral hazard depends on the type of reputation, i.e., whether it is based on the buyer's assessment or the seller's prior knowledge. Furthermore, reputation can influence the seller's choice of price, the buyer's behavior and the seller's decision to leave the market. The authors conclude that reputation can be an effective means to reduce moral hazard in C2C marketplaces and suggest that e-commerce platforms should encourage and reward sellers who build a good reputation.

The research focuses on game theory, with a focus on information asymmetry and agency problems. The authors develop a model of agent behavior in a C2C e-marketplace in which a moral seller has access to better information than the buyer. Research results indicate that when sellers can build a positive reputation, buyers are willing to pay. C2C marketplaces are becoming increasingly popular around the world due to the spread of digital technologies and growing user confidence in online shopping. These markets have received a boost from increased environmental awareness. However, there is still mistrust on the part of the public due to the fear of being cheated. The informal market is a subset of the C2C market, characterized by a lack of official regulation. This market has seen a 275% increase in sales in the vintage clothing sector alone since 2020, and 81% of second-hand buyers expect to spend the same amount or more in the next five years.

Informal markets within social platforms, for example, have also had a lot of diffusion, and have several advantages, such as the ability to sell second-hand or niche items at a lower price than the market, but also the potential for unreliable sellers and fraudsters. Buyers should be aware of the challenges associated with these markets and take precautions to avoid fraud or low-quality products. One study showed that the availability of formal alternatives, such as online sales sites, is a key factor influencing the decision to sell on informal marketplaces. Sellers who are more confident in the value of their product tend to sell on informal markets, as these markets offer more control over the price and negotiation of the transaction. Buyers should be aware of the challenges associated with these markets and take precautions to avoid fraud or low-quality products.

The online digital marketplace has become increasingly popular in informal marketplaces, with sellers reselling digital objects such as tickets for transport and events. To mitigate the risks

associated with the use of online platforms, they have introduced security features such as reviews and ratings of sellers and buyers. Aggregation platforms have also emerged that offer greater price transparency, ease of access, and the ability to quickly compare available options. The platforms that provide a total view of all offers in the marketplace are aggregator platforms that use programmed called "crawlers" or "spiders" to browse and analyze company pages, extracting information on prices, availability, and features of offers. APIs act as a 'bridge' between the aggregator's platform and the company's information system, facilitating real-time data exchange. Ticket aggregators offer numerous benefits to both consumers and companies, such as the ability to quickly compare prices and options available on a single platform, price transparency, increased visibility and access to the market, and reduced marketing and distribution costs. APIs are essential for integration and interoperability between different platforms and services, as they enable the exchange of data and the realization of common functionalities in a simple and standardized way. Scraping is a technique used to extract data from web pages or other online resources.

Possible solutions

As already mentioned, among the possible technological solutions we could have the blockchain, Blockchain technology is a distributed database that is decentralized and constantly updated with a record of transactions and events shared by network users. It is a digital ledger where data is transmitted over a network of computers, allowing anyone involved to modify the information without needing approval from a central authority. The security of transactions is maintained through the technology's immutability characteristics and structure, and encryption is used to provide secure authentication and verification of transactions. The public key is used to identify the sender of a message or transaction, while the private key is used to verify the sender's identity. The block size determines the overall volume of transactions that can be stored in a block, and once a block has been produced, it is distributed to miners who must validate each transaction in the block.

The first block of a Blockchain is known as the genesis block, and it has no parent block. Blockchains are divided into programmable and non-programmable, with programmable blockchains allowing programming logic to be implemented directly on the blockchain. Consensus Mechanisms are used to evaluate how a transaction can be validated and update the register. Bitcoin was the first Blockchain to be established, and it implements the Proof of Work mechanism, which uses cryptographic competition to allocate validation privileges and rewards

among miners. To address this, Proof of Stake has been created, which selects validators at random based on two criteria linked to the coin they have staked.

POS (Proof of Stake) systems use a combination of characteristics such as staking lifespan and node worth, as well as randomness, to promote nodes other than the richest nodes on the network. Proof of Work and Proof of Stake are two of the most common consensus algorithms used in blockchain, and they use different mechanisms. PoW requires miners to solve a complex computational problem to validate transactions on the blockchain network, while PoS requires participants to possess a quantity of coins in the network (staking) to be selected as a validator.

Blockchain-based e-commerce is a paradigm shift in traditional marketplaces, characterized by problems of security, transparency, and reliability. It uses self-executing smart contracts to secure deposits and payment processes. Smart contracts are applications that connect sellers and buyers directly, reducing commissions and improving transaction efficiency. Blockchain allows for decentralized management, making information manipulation and fraud more difficult. It also makes it possible to simplify payment processes, guaranteeing greater security of transactions and avoiding data leaks. However, blockchain presents some limitations and challenges, such as the need for adequate technological training to use the platform and the difficulty of buying and exchanging cryptocurrencies at the interface level for users.

The identification and verification of users is essential to ensure security and trust in the blockchain-based e-marketplace. Smart contract logic is applied, the information registry manages profile information, the function token management server verifies whether a requestor is a buyer, and the marketplace client can register data/functions or check the information sold. The global virtual goods market is expected to reach $189.76 billion by 2025, and blockchain technology may revolutionize the ownership of virtual goods. Incentives are needed to ensure the blockchain network is secure and reliable and can be provided through the creation of a market-specific cryptocurrency.

The Algorand blockchain network is designed to be a scalable platform that can quickly process large numbers of transactions. It is based on a new consensus algorithm called Pure PoS, which addresses the scalability and security issues associated with traditional PoW and PoS consensus mechanisms. The block proposal phase selects multiple block proposals using a verifiable random function (VRF). The voting power in the soft committee is proportional to the sum of

the contribution of each node and the votes are used to select the proposed block with the smallest VRF spread.

ALGO is a utility token that can be used to pay transaction fees and store data on the blockchain. It is designed to be a payments-focused network with rapid transactions and a focus on achieving near-instant finality. The comparison table between traditional PoS and Algorand-based PoS includes features such as selection of validators, scalability, security, cost, rewards, and incentives. Algorand-based PoS theoretically offers greater security, scalability, and active participation of validators than traditional PoS, and the cost of becoming a validator is relatively low, ensuring a decentralization of the network.

Trust.io - Business model

Trust.io's business model is based on the creation of a blockchain-based ticket aggregator and marketplace. To generate revenue, Trust.io will implement a per-transaction commission model, taking a percentage of each sale as a commission. Additionally, Trust.io can explore other monetization opportunities such as the sale of advertising space, aggregated data sales, and native token exchange fees. The key to Trust.io's success lies in being able to attract enough sellers and buyers to create a vibrant and competitive marketplace. To do this, Trust.io needs to invest in building a user-friendly, secure, and transparent platform and effective marketing strategies.

Trust.io is an advanced digital ecosystem designed to manage the buying and selling of event and transport tickets securely, transparently, and efficiently between individuals. This is achieved through the implementation of innovative technologies such as blockchain and smart contracts based on Algorand's blockchain. Trust.io's platform acts as a ticket marketplace aggregator that keeps tickets in a secure cloud environment accessible until hours before the event, its unique value proposition includes the transparency and security of blockchain, a cloud ticketing and ticket verification by default service that can help prevent fraud and ensure secure and verified transactions. Engagement is further enhanced by the tokenization mechanism, which involves the issuing of tokens on Algorand. Trust.io is aimed at a broad spectrum of buyers, including people with low to upper-middle incomes. The type of tickets that can be purchased within the platform include coupons for events, including concerts, theatre performances, festivals, sporting events and train tickets. The initial geography focused on the Italian area, but with the potential to expand later to other regions and countries.

Trust.io is at the 'Market Development' stage of the Ansoff matrix, which involves the introduction of an existing product or service into a new market. The Italian online market for buying and selling concert tickets was estimated at 450.5 million euro, offering many opportunities for the start-up. Market trends include the growing consumer preference for online purchasing, advanced ticket verification and authentication systems, anti-bagging techniques, and transparent refund policies and flexible ticket resale solutions. Secondary ticketing is estimated to have 500-1000 tickets put up for sale on social media.

The start-up offers an innovative online platform that facilitates the secure buying and selling of event and transport tickets between individuals. Trust.io is a unified platform that brings together different ticket providers for events and transport.

It is based on several key steps: ticket acquisition, storage, and delivery. Each ticket and each subsequent transaction is registered on the blockchain via a smart contract, being recognisable by a unique transaction code. Additionally, the decentralised nature of the blockchain makes the platform resilient to problems typical of platforms acting with intermediaries, ensuring a reliable service to users. The native token based on Algorand's blockchain is used both as a transaction tool within the platform and to incentivize positive behaviour among users.

The token-based incentive mechanism is a key component of the customer loyalty strategy, helping to create a safe and reliable online ticket buying and selling environment. The proposed business model offers users the opportunity to earn returns on their tokens, creating an incentive to actively participate in the platform. Additionally, the staking mechanism is implemented, which is made accessible and understandable to the average user through a clear and simplified interface. The cloud ticketing service is a central element of the platform's value proposition, allowing users to purchase tickets for events and transport and store them securely and transparently. Upon purchase, the user receives a temporary QR code that certifies that the user has purchased the ticket, but it is not yet valid for access to the event or means of transport. If the user decides not to sell the ticket, they can redeem it through the platform and receive the original ticket.

The start-up's market strategy focuses on four main customer segments: Individual users purchasing tickets for events or transport, Users interested in purchasing tickets from individuals, Ticket distribution companies, and Event management companies. The platform

offers a reliable way to purchase tickets from individuals, Ticket distribution companies, and Event management companies as an additional sales channel, increasing their visibility and reaching a wider audience. The website provides detailed information about the start-up, its functionality, and services, as well as a secure portal for buying, selling, and storing tickets. Integration with major social media is planned to engage and build user loyalty, promote its services, and provide an additional channel for service and support.

The aim is to develop a robust online community, collaborate with influencers in the entertainment and transport industries, create a loyalty program, and create sources of revenue. Trust.io's revenue plan includes two main sources of income: transaction fee and provider fee. Transaction fee is the main monetization mechanism, charging a 6% fee on each ticket sold. Provider fee is a fee granted by the ticket issuer for each ticket sold. Additional income streams include sale of advertising space, token-based business model, aggregate sale of data, and penetration and sustenance strategies. To maximize income generation, the plans is to implement additional income streams in the years to come, such as sale of advertising space, token-based business model, aggregate sale of data, and penetration and sustenance strategies.

The cost structure of a blockchain-based start-up such as Trust.io is complex due to the nature of the business. The Cost of Goods Sold (COGS) is the costs directly related to the production or provision of the services offered by Trust.io. This includes cloud costs, web marketing costs, advertising, SEO, collaborations and sponsorships, and translation costs. Cloud costs are expected to cost 100€ per month by 2023, gradually increasing to 600€ per month by 2026. Web marketing costs include app and site sponsorship through social channels, and payment for online advertising.

Translation costs are expected as the company expands into new markets. Costs related to the development of the token on Algorand, the deployment of the smart contract, and API-related costs are expected to vary depending on the complexity of the smart contract, network fees, and future changes to the smart contract. CAPEX (Capital Expenditures) are expected to be included in the budget, as they contribute to the creation of a long-term asset.

Trust.io's value proposition is the ability to provide a secure and transparent experience for the purchase, sale, and resale of event tickets. Key resources include the blockchain technology, the development and management team, the user base, and strategic partners. The scalable and

secure technology platform is a key element for the functioning of the service offered. IT security and data protection is a priority for the start-up. The user-friendly interface and the ability to customize preferences make using the platform intuitive and enjoyable.

Key activities include platform development and maintenance, marketing and user engagement, and strategic and partnership management. Creating marketing plans, and commercial strategies and partnerships are key elements for success. Forming alliances with key players in the events and transport sector can improve the visibility of the platform, increase user trust, and create synergies that can accelerate growth. Trust.io's marketing plan focuses on creating a presence in the digital marketplace, educating the public on blockchain technology, establishing trust with users, and creating an active social media community. Using Digital Marketing, Trust.io will focus on SEO (Search Engine Optimisation) and SEM (Search Engine Marketing) to ensure optimal visibility in search engines. A focus pillar is to have an active and engaging presence on major social media exploring potential partnerships with influencers and other key industry players to increase the platform's visibility and credibility., that allows it to establish a relationship of trust with its users, all to generate sustainable and scalable growth over time. To build a loyal and active user base, Trust.io envisages several engagement strategies, such as a referral program, a token-based incentive system, and an engaging and personalized user experience.

The Trust.io platform, in its early and upcoming phase, faces several crucial challenges that are regulatory, legal, competitive, user trust, scalability and ticket innovation in nature. First, the issue of regulation and legal compliance is a significant challenge, as full adherence to all relevant laws requires a considerable investment of time and resources. The competitive environment constitutes a further challenge for the platform. Indeed, the start-up is operating in a market where several established players, such as Ticketswap and PayPal, already have a large presence. Competing with these entities requires an effective strategy to differentiate oneself and gain a significant market share. Beyond this, gaining user trust is no less of a challenge. To attract and retain users must prove its reliability and security. This implies not only creating a technologically secure platform but also building a positive reputation among its users. Scalability also presents another challenge. While the future expansion of the platform is certainly a goal, this may entail difficulties in managing growth, maintaining quality of service, and adapting to local regulations. This requires careful strategic planning to ensure that the platform can grow sustainably.

Opportunities include growing digitization, innovation in the ticket industry, and improved user experience. Trust.io is a start-up being proposed at the Dock3 - The Start-Up Lab, where the idea is being designed with the help of mentors and experts, and also to Lazio Start-up Cup, a pre-acceleration program offered by Lazio region. The project will follow a well-defined roadmap, beginning with the development of a Minimum Validated Product (MVP) to test the market response and gather feedback. The Conception Phase involves the definition of the idea, market research and validation of the concept, design phase involves the business model, development phase involves the integration of the Algorand blockchain, launch phase involves testing and finalization of the MVP, growth phase involves expanding the platform, establish further partnerships, and integrate new functionalities.

Financing is a key element in the development and growth of Trust.io. Venture capital or business angel investments are envisaged to provide capital in exchange for an equity stake in the company. The choice between venture capital and business angels will depend on various factors, such as the stage of development, the amount of financing required, and the conditions offered by the investors. Venture capitalists tend to invest in companies that have the potential to scale quickly and reach a large market, like Trust.io. They can also offer more significant investments that can support Trust.io's rapid growth and its goal of scalability.

The aim is to fill clearly defined needs through technical and industry expertise, a network of contacts, strategic and managerial support, and university-backed acceleration programs. The most important details in this text are that Trust.io is planning to expand the functionality of its application to offer an increasingly comprehensive and customized service and that technology transfer is a process by which a technology, skill, knowledge, or expertise developed in one organization is used in another organization or sector to create new products, processes, or services. Technology transfer could take place through the formation of partnerships with other organizations or sectors that could benefit from the application of Trust.io's technology, which could open new business opportunities for the startup, contribute to the dissemination and development of blockchain technology, and create value for a variety of stakeholders.

The immutability of blockchain information can have significant implications for data protection and GDPR. This includes the right to be forgotten, which allows individuals to request the deletion of their personal data when there are no legitimate grounds for continuing to process it. To mitigate this, it is possible to limit the amount of personal data written on the

blockchain, store only references or hashes of such data, and store the most sensitive personal data off-chain in a centralized database located within the EU. The General Data Protection Regulation (GDPR) requires the explicit consent of users for the processing of their data, as well as ensuring the security of them. It also recognizes the right of users to access, rectify and delete their data.

Trust.io does not incur legal issues related to selling in the secondary market, as it acts as an intermediary between users, not selling tickets directly. This positioning helps to ensure greater protection for platform users. Stakeholder involvement is essential for the success of a start-up, including investors, customers, partners, employees, and the community at large. End users are the customers who use the platform to buy, sell, or exchange tickets, while service providers are investors, regulators, and employees. Investors provide the capital needed to grow the start-up, while regulators maintain compliance with applicable laws and regulations.

Employees are essential to the success of the company, and their commitment is essential to the success of the company. The quintuple helix model is an innovative approach to governance that considers five stakeholder groups: universities/research institutions, industry, government, environment, and civil society. This model offers an effective framework to engage all stakeholders in an open and constructive dialogue. Universities/research institutions collaborate to stay at the forefront of blockchain technology development, industry partners create a robust ecosystem, government authorities ensure compliance, the environment minimizes its ecological footprint, and civil society involves users in building an active community and a fairer secondary ticket market.

Trust.io is committed to implementing a sustainable governance model to promote innovation, quality infrastructure, sustainable consumption and production practices, an inclusive and respectful working environment, gender equality, decent work, and economic growth. Challenges include the widespread adoption of blockchain technology, regulating the secondary ticket market, managing stakeholder expectations, and creating a new standard for the ticketing industry. The start-up is committed to minimising its ecological footprint, creating a positive impact on society, and pursuing clear and transparent governance principles. These initiatives help create a sustainable governance model that aligns start-ups with the UN Sustainable Development Goals and makes them attractive to responsible investors.

Conclusions

The thesis "Trust.io: Can a Start-up Based on Blockchain Help to Solve the Information Asymmetry in C2C Markets?" conducted an in-depth and multifaceted investigation into the interaction between blockchain technology and C2C markets, highlighting how an innovative start-up can address and potentially solve the problem of information asymmetry.

At the heart of the investigation stands Trust.io, a start-up whose business model is based on blockchain. The analysis highlighted how Trust.io, with its native token on Algorand and cloud ticketing service, can embody a revolutionary approach in the C2C landscape, helping to create a fairer, more transparent, and more secure marketplace. The potential for further development, the implications of GDPR and the immutability of blockchain information, and the importance of a sustainable governance model for long-term success were considered.

The thesis demonstrated that, through the innovative and thoughtful application of blockchain technology, has the potential to Trust.io's approach of integrating close collaboration with stakeholders and a sustainable governance model is an example of how companies can combine technological innovation and social responsibility. This is particularly important in the current context, where consumer trust is increasingly becoming a key success factor for companies. Trust.io represents not only a response to the current problems of C2C markets but also a vision of what the future of these markets could be. The conclusion of this study does not mark the end, but the beginning of a broader path of research and experimentation. Blockchain technology offers unexplored possibilities that can revolutionize various sectors and markets, and Trust.io is just one example of how this technology can be used to create innovative solutions and solve complex problems. It is hoped that this work will provide a solid basis for further research and experimentation in this promising field.