

A Scalable Framework for Game Transformation and Metaverse Financing

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Abstract

This project explores the integration of blockchain technology into the gaming industry, aiming to reshape the financial interactions within virtual economies through a novel tokenomic framework. Addressing the limitations of current gaming models, such as non-transferable in-game assets and the lack of a robust secondary market, the project proposes a tri-token system to facilitate a sustainable and decentralized gaming ecosystem. The research includes comprehensive industry case studies, which highlight the challenges and opportunities in the sector. A software prototype, being developed as a POC, demonstrates the potential for seamless transactions and interactions within the NFT gaming space for existing games. The forthcoming white paper will detail the research findings and outline the economic and technical implications of the proposed model. An ICO will seek to fund the further development of the project, signalling a transformative step towards a new era of Game Finance aligned with Web 3.0 philosophies.

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1. Introduction

The advent of blockchain technology is reshaping the global financial landscape through offering a wide spectrum of alternative investments, including but not limited to cryptocurrencies and Non-Fungible Tokens (NFTs). NFTs have emerged as a prominent feature of blockchain-based transactions, allowing unique digital assets to be transferred and owned securely on respective blockchain ecosystems. This lays the foundation for “play-to-earn” (P2E) ecosystems in blockchain gaming. Gamers could upgrade in-game items through gaming activities and trade them publicly for designated cryptocurrencies. Low-income and unemployed individuals can hence secure everyday essentials with gaming [1].

The aggregate market volume of gaming industries poise for significant growth with Generation Z entering the workforce. The market value is projected to reach USD 321 billion. by 2026 [2], of which most revenue generated is derived from real-time multiplayer online games with a primary market-based business model. These game providers realize profits by selling in-game items to gamers with fiat currency. A vital limitation of such is the non-transferability of the in-game items purchased. The items are incapable of creating additional market value to corresponding ecosystems. The absence of a comprehensive secondary market obstructs return realization and hinders Game Finance (GameFi) development, as if traders could only subscribe shares from Initial Public Offerings (IPOs) but there are no public exchanges. Meanwhile, there are a few well-

known game providers offering in-game exchanges, e.g., FIFA series powered by Electronic Arts (EA) Sports, charge in-game credits as transaction fees. However, the collected amounts hold no intrinsic value to game providers [3]. A public exchange for in-game items enables open trading for potential secondary sales is therefore critical for the broader gaming community. Blockchain technology and NFT-based ecosystem perfectly matches the context and serves as the technical foundation for the required enhancement.

The paradigm shift of the gaming community to Web 3.0 is gaining momentum but lacks clear incentives and methodologies. The ongoing evolution of the well-established gaming industry introduces growing business risks and technical obstacles in decentralizing existing gaming experiences. Hence, the community needs a comprehensive transformation proposal for game providers.

2. Scope and Objective

This project is proposing a well-defined framework for developers to accomplish arisen software engineering requirements methodologically integrated with a motivational tokenomic ecosystem to incentivize game providers making the transition. This assures providers that they can seamlessly connect their ecosystems to the broader secondary exchange provided with a smooth game transformation to Web 3.0. In addition, the consolidated solution could serve the financial ground of projects considered prodigal, e.g., Metaverse-related developments.

This project is going to make two key deliverables. First, a tokenomic framework will be delivered with a proposed Initial Coin Offering (ICO). The framework will critically address and offer the economic incentives required for existing game providers to opt for a paradigm shift to the Web 3.0 based ecosystem. Second, a software engineering prototype will be delivered as a Proof of Concept (POC), which includes a user interface for gamers and an Application Programming Interface (API) for software developers to connect the secondary exchange experientially and programmatically respectively. The transactions will be based on existing blockchain networks.

3. Methodology

To achieve the key objectives of this project, four milestones must be reached. This includes industry research (Section 3.1.), formulation of tokenomics (Section 3.2.), POC software development (Section 3.3.), and publication of white paper (Section 3.4.) as below.

3.1. Industry research

Extensive research on the gaming industry, blockchain technology, tokenomics, and GameFi was conducted. Both primary and secondary sources were leveraged to gather data and insights. Three case studies were conducted to deepen understanding of business models in both blockchain and traditional gaming. A comparative analysis was performed based on the business models of the selected cases.

Axie Infinity, and FIFA video game series, were selected to be the subjects of the two case studies respectively. The selected cases are of crucial market significance in the gaming industry. Axie has generated over \$1.5 billion in NFT trading volume by allowing players to truly own in-game asset NFTs and monetize them through decentralized exchanges [4]; FIFA soccer video game series profits over \$1 billion annually from in-game purchases and packs [5]; Annual reports and financial filings from these game providers were analysed to evaluate the quantitative economic relationship between primary sales revenues and secondary sales revenues (i.e., transaction fees of in-game items). The possible obstacles that might be encountered by game providers in the transformation will be discussed.

3.2. Formulation of tokenomics

Using the research findings, token economic models tailored for the gaming industry are being formulated. Both utility tokens and security tokens are being designed with associated incentive structures to enable sustainable growth and value creation in blockchain gaming [6].

Economic analysis is being performed to model token demand curves, supply emission rates, and equilibrium pricing based on projected user growth and platform transaction volumes. Revenue maximization concepts from game theory are being applied to optimize pricing, staking rewards, and inflation schedules [7]. Data is being synthesized from empirical studies on consumer demand elasticity in digital

economies. Token bonding curves is being calibrated to balance initial speculative pricing during an ICO launch with long-term price stability as the token becomes fundamentally valued from growing utility and adoption. Dynamic pricing algorithms are being developed using discounted cash flow models.

Different token minting and distribution strategies are being evaluated, including direct plays through gameplay, staking rewards for governance rights, and liquidity mining for market making. The optimal mix depends on balancing incentives for different network participants like developers, node operators, influencers, and end users.

3.3. Software development

A POC will be developed to demonstrate the proposed tokenomics and allow users to interact with the NFT gaming ecosystem. The POC will consist of a front-end application, backend API, and smart contracts on the blockchain.

The frontend will be built using Next.js, a React-based framework that enables server-side rendering and static site generation for optimal page performance [8]. Next.js supports interactive User Interfaces (UIs) and clean component architecture suitable for the game marketplace and exchange.

The backend API will follow a Representational State Transfer (RESTful) design pattern using Node.js and Express. This enables a scalable and organized interface for Create, Read, Update, and Delete (CRUD) operations and endpoints like user authentication, NFT data, and

transaction requests [9]. RESTful framework organizes endpoints into logical resources while keeping APIs fast and lightweight.

Smart contracts will be written in Solidity to implement core functions like NFT minting, trading, and swapping on the Ethereum blockchain [10]. Hardhat will be used for local Ethereum network deployment during development. Web3.js provides integration with MetaMask wallets.

3.4. Publication of white paper

The project research and outcomes will be consolidated into a formal white paper for publication and distribution. The white paper will follow a standard academic format consisting of an abstract, introduction, background, methodology, proposed design, analysis, conclusions, and references. Drafts will be compiled in LaTeX and iteratively refined. Sections will be reviewed by advisors and collaborators to ensure technical accuracy and clarity for readership. Proofreading will finalize spelling, grammar, formatting, and citations based on IEEE editorial style guidelines.

In parallel, an ICO will be conducted as a crowdfunding mechanism to support development. An ERC-20 standard token will be minted on Ethereum as the fundraising utility token [11]. A website, lite paper, and promotional materials will be created to market the ICO and attract investors to participate in the token sale. A fundraising model will be structured based on valuation, funding goals, and sale phases. Token listings will be sought on cryptocurrency exchanges to enable price

discovery and liquid secondary trading. ICO proceeds will fund hiring engineers, operations, and initiating the POC roadmap. The white paper and ICO will provide a transparent, compliant path to generating community interest and bootstrap financing for the project.

4. Result

Industry research on Axie Infinity and FIFA offer valuable insights into the realm of virtual economies and the emergent blockchain gaming space. Both case studies imply the importance of aligning tokenomic structures with player incentives and the necessity for mechanisms that balance speculative behaviour with genuine gameplay (see **Appendix A**). The decline in Axie Infinity's active users signals the need for governance models that ensure long-term engagement and resist hyperinflation, while FIFA's model suggests the potential for increased asset longevity, players', and providers' benefit through decentralized solutions in open market dynamics.

Meanwhile, overly volatile market poses a significant risk for game providers adopting token-based ecosystems. The value of cryptocurrencies could increase or drop unpredictably due to speculative trading and external factors, undermining the stability required for in-game economies. Such unpredictability can disrupt user engagement and retention, as players face potential losses from depreciating digital assets. Game developers, who typically strive for unsurprising game economics, may view this volatility as antithetical to the balanced, equitable gaming experiences they aim to offer, making them hesitant to integrate these technologies into their financial ecosystems.

One approach to the problem will be adopting a tri-token system (see **Figure 1**), in contrast to a dual-token economy as observed in the majority of blockchain games to separate into three key functions, that are i) the utility token (UT) is designed as the stable primary currency within the games; ii) the value accrual token (VAT) focuses on wealth distribution and value retention within the

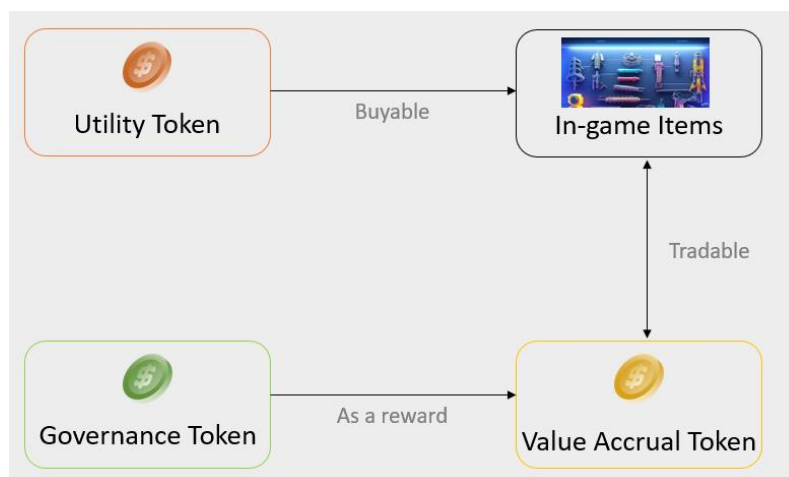


Figure 1 The proposed tri-token ecosystem with utility token, governance token and value accrual token.

ecosystem; and iii) the governance token (GT) that encourages the community to make sustainable contributions (see **Appendix B**).

Gamers can convert fiat currencies to UT just as regular games, then trade in-game items as tokens or NFTs (depends on game scenarios) with game providers via primary sales. Afterwards, the gamers can trade their in-game items in the open exchange with their counterparts for VAT. The transaction fee collected in the C2C transactions will be allocated to GT holders and respective game providers. Finally, the game providers could redeem fiat currencies with UT.

The tri-token system incentivizes different stakeholders to join the network and employ policies encouraging transactions. For game providers, they are benefited from stable UT

that ensures predictable revenue streams and are encouraged to strategize in-game items with higher trade values turning VAT reward more valuable. For contributors, they are incentivized to sustain the ecosystem and facilitate trading activities to earn more VAT reward. For gamers, they are provided with a decentralized and liquid platform to realize their returns in which their value can be accumulated in VAT.

The tokenomic ecosystem is supported by a software engineering prototype (see **Figure 2**). This prototype serves as a POC for game developers to communicate with the ecosystem programmatically. In addition, an UI for facilitating gamers to trade items conveniently. This enhances the user and developer experience while navigating with the ecosystem.

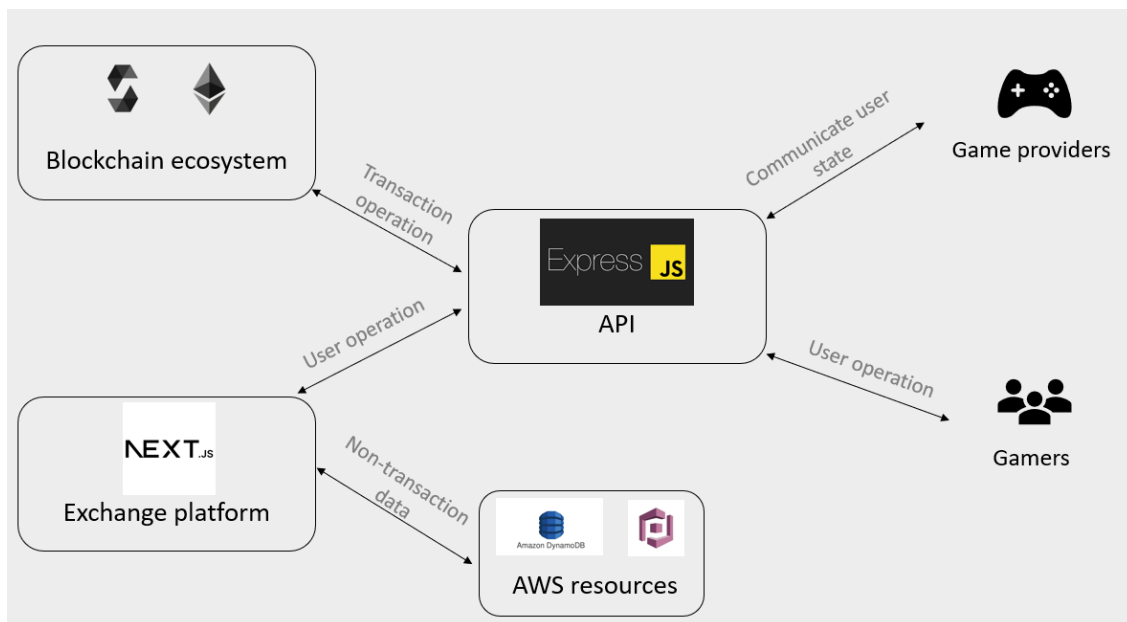


Figure 2 The proposed software architecture utilizes centralized resources to enhance user experience as sole blockchain application may suffer from performance issue with high volume operations.

5. Upcoming Work

After completing the software POC as outlined in Section 4, the project will transit into dissemination and funding phase (see **Appendix C**). A white paper that gives a full account of our research, the economic models we propose, the design and functionality of the POC, and its potential impact on the market.

Alongside the publication of the white paper, we will launch an ICO to raise funds needed to further develop the project. The ICO will offer new digital tokens, based on the standard ERC-20 protocol, which will be key to the fundraising strategy.

This phase will also include a focused marketing campaign to inform potential investors about the ICO and the value of the project, using the white paper as a detailed guide. By combining academic reporting with targeted fundraising efforts, we aim to build interest in our project, attract investors, and set the stage for future growth.

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Appendix A – Industry Research

A case study on Axie Infinity

Axie Infinity developed by Sky Mavis represents one of the first and most successful implementations of blockchain-based gaming centered around tradable NFT assets. Since launching in 2018, Axie has generated over \$4 billion in total NFT trading volume and achieved over 2.5 million daily active users at its peak popularity [12], [13].

The core of Axie's economic model is driven by a P2E mechanics associated with an internal tokenized economy centered around fungible ERC-20 utility tokens, i.e., Smooth Love Potion (SLP) and Axie Infinity Shards (AXS). SLP can be earned by gamers through winning battles against their opponents in the Ranked Arena Mode. It can be used to breed Axies with varying rarity traits following a common ERC-721 standard [14], which can be upgraded through gameplay in Adventure Mode. Axies could be publicly traded on the Ronin Network, an Ethereum-linked sidechain, for AXS. Both tokens can be exchanged for fiat currency on exchanges or used to purchase additional Axies and items on Axie's internal marketplaces [15]. As of September 2022, over 1 million Ethereum wallets own at least one Axie NFT, indicating a high level of asset distribution [12]. Axie's secondary market saw over \$200 million in NFT sales in July 2021 compared to only \$15 million in primary sales directly from Sky Mavis [16]. With 19.5 mil. total transactions in the period, it accounts for an average of \$11.03 of revenue generated per transaction. The secondary market for breeding and trading Axies is highly profitable.

During Axie's peak popularity in 2021, over 2.5 million daily active users participated across various aspects of the ecosystem [13].

However, this number has since declined 95% to around 50,000 as of mid-2022, posing questions around long-term retention [13]. One major critique of Axie Infinity is the high barrier to entry for new gamers in terms of upfront costs. To start playing, gamers must purchase at least 3 Axies. The average price of an Axie surged to around \$200 at the peak in 2021, requiring an upfront investment of \$600+ just to start playing [17]. This priced out users only interested in casual gameplay. The scholarship program was intended to subsidize new players, but complex processes combined with speculation made obtaining scholarships difficult in practice [18]. This resulted in a model catered heavily towards speculative investors rather than gamers, misaligning the economy from its original utility vision. With users focused on profit first, gameplay and community building suffered [19].

Incentives promoting speculation were further exacerbated by design choices like potions which boosted rewards. When combined with robots, this undermined the sustainability of organic reward distributions. Rampant breeding also led to hyperinflation of low-value Axies, diluting the perceived value of NFT assets [20]. Critics argue that unchecked open markets amplified volatility, with Axies traded more as financial assets than game pieces [21]. Prices became detached from underlying utility. The declining engagement down to 50,000 daily active users in 2022 signals issues in retaining true gamers.

The Axie Infinity's trajectory provides an important case study in how tokenomic structures can go astray when mechanisms to align incentives and constrain harmful

speculation are absent. Further research is needed around governance protocols that promote sustainability and fair participation.

A case study on FIFA series

The annual FIFA soccer video game franchise published by EA provides valuable insights into the design of virtual economies and monetization systems in modern gaming. Since its inception in 1993, the series has amassed over \$20 billion in lifetime revenue, with a record \$1.62 billion earned from extra content like FIFA Ultimate Team (FUT) cards in Fiscal Year 2021 [5].

FUT, first introduced in FIFA09, enables players to obtain virtual player packs and build fantasy squads [22]. This gamified the traditional Panini soccer sticker collecting culture within an innovative virtual economy. Rare player cards with special designs hold artificially scarce supply and high demand on FUT's Transfer Market auction house. As per traditional microeconomic theory, constrained supply fuels speculative valuations, with certain premium meta cards attaining aftermarket prices of even millions of in-game credits [23]. FUT's marketplace charges 5% in-game FUT Coins as transaction fee. This regulates the total supply of in-game credits to sustain the economic ecosystem.

Digital packs contain randomly generated player assets, like physical trading cards. However, drop rates for high-value cards are tuned to miniscule sub-1% probabilities [24]. When coupled with effective price anchoring tactics for pack bundles, these drives recurring monetary spending. In FY2021 alone, 2.3 billion FUT packs were opened according to EA's annual report [5]. FUT Coins earned slowly through gameplay present a high grind time for premium cards.

Consequently, most players opt for upfront real-money purchases. Dibonaventura analyses this as a manifestation of induced value theory, whereby the randomized packs leverage prospect theory principles to increase subjective valuations [25]. Furthermore, Chang applies Maslow's hierarchy to posit social esteem needs within the FUT community are met through rare squads, forming a basis for pack purchases [26].

While generating billions in revenue, FIFA's closed, proprietary ecosystem impedes open asset markets and cross-title portability that would benefit players [27]. For example, FUT cards and coins remain locked within each annual version, preventing carryover to future titles. This diminishes long-term utility and liquidity for players' hard-earned virtual assets. In economic terms, restricting secondary markets leads to market inefficiencies and value leakage from the ecosystem.

Appendix B – Detailed Tokenomics

	<u>UTILITY TOKEN (UT)</u>	<u>VALUE ACCRUAL TOKEN (VAT)</u>	<u>GOVERNANCE TOKEN (GT)</u>
OBJECTIVE	To be used as a transactional token with stabilized price to buy in-game items from game providers.	To be used as a security token that stores value. It is used in C2C transaction.	To be used as representing the right to participate in ecosystem development and to obtain reward.
TOKEN DISTRIBUTION	Anyone can mint utility token by freezing a predetermined (and fixed) amount of USD and unfreeze it by burning equivalent of UT.	ICO	Distributed predetermined amount to early contributors. New GTs will be minted and allocated to personnels who make contributions.
TOTAL SUPPLY	No fixed cap	Fixed cap	No fixed cap
TOKEN ECONOMICS	N.A.	Deflationary	Inflationary
INCENTIVE STRUCTURE	UT is stabilized as it can only be minted by freezing fiat currencies → gain game provider confidence in moving to Web 3.0 development and stabilize their revenue stream with secure protocol	As VAT is deflationary with fixed supply, the value is expected to increase with demand when more gamers entering the ecosystem → align gamers' expectation on realize returns Part of the transaction fee is allocated to the game provider of which the item is come from → encourage game providers to design items with high trade values	Transaction fee collected in C2C transactions will be awarded to GT holders evenly → it discourages non-contributors to own GTs as the value diminishes over time, however contributors are incentivized to make more contributions (to earn GTs) on sustaining stakeholders to participate in-game items trading (to make VAT more valuable).
TRANSACTION FEE	Network fee	Network fee + value-add fee	Network fee

Appendix C – Project Schedule

<u>Month</u>	<u>Description</u>	<u>Deliverable</u>
October	Literature review Case studies on selected game providers	Project Plan
November	Evaluate game economies and business models Formulate tokenomics	Case studies
December	Examine and fine-tune the framework Prepare for ICO UI & API development	N.A.
January	Draft ICO white paper UI & API development	Interim Report
February	Finalize ICO white paper Complete UI & API development	ICO white paper UI & API
March	Start ICO campaign Refine framework based on feedback	N.A.
April	Prepare final report	Launch ICO Final Report