

AI and Blockchain Convergence in Freelance Labor Platforms: A Review of the Gig Economy, Skill-Based Matching, and Decentralized Trust Mechanisms

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Abstract: *The gig economy has evolved to become an employment model all around the world. However, the digital platforms that are used to connect people to opportunities in the gig economy, like Upwork, Fiverr and Freelancer.com. Have challenges with respect to trust, pricing and access to opportunities for new participants. This paper reviews academic research and reports from four fields which are connected: evolution of the freelance labor market, technologies that allow for matching skills to job opportunities, blockchain-based mechanisms of trustless agreements and digital identity and gamification mechanisms based on tokens. From more than twenty articles, the following conclusion emerges: existing solutions address only some parts of the problem. Thus, according to this paper, the solution to these challenges can be found in 2GATHERS, a platform based on artificial intelligence and blockchain technologies. The paper offers details about the research and development required to implement such a platform.*

Keywords - *Gig Economy, Freelancer Platforms, AI-based Recommendation Systems, Blockchain Technology, Smart Contracts, Decentralized Identity, Tokenized Economy, Skill-based Matching*

I. INTRODUCTION

The global labor market has undergone significant changes over the last decade towards the increasing dominance of flexible, project-based employment. The global freelancing workforce currently stands at people. The market size of the platforms for freelance work was estimated to be US \$4.93 billion in 2023 and is forecasted to reach US \$14.39 billion by 2030. The number of Indian freelancers is estimated to be around 15 million, proving the growing trend towards digital labor being concentrated in India. However, the development of platform infrastructure did not keep up with the changes in the size of the freelance economy. Freelancers still struggle with unclear reputation systems, lack of income security and excessive fees paid to intermediaries. At the same time, clients struggle to verify the reliability of freelancers. This literature review consolidates findings from four fields relevant to the problem: sociology and economics of gig work, AI-powered talent matching, blockchain-enabled trust infrastructure and token-based engagement design.

I. EVOLUTION OF THE GIG ECONOMY AND EXISTING PLATFORMS

Employment as "work" and the trade-offs of security with freelancing [1]. Subsequent analysis carried out by the McKinsey Global Institute indicates that independent work

has become a desirable career choice among skilled individuals rather than a backup career [2]. This trend was greatly accelerated by the COVID-19 pandemic during which more than a third of the workforce in the U.S. carried out freelancing activities, generating an extra \$1.3 trillion dollars in the economy [3]. The World Bank has also noted yearly growth in the number of laborers working across borders online in developing nations [4]. Amidst this development, Wood et al. In their analysis of the "Good Gig, Bad Gig" among platform workers find that algorithmic controls and ratings end up negating the flexibility associated with freelancing by turning workers into commodities competing on prices [5].

The "Experience Paradox", described by Palla, demonstrates the disadvantage that the visibility of reputation mechanisms on platforms like Upwork brings to newcomers, since newcomers cannot get any jobs without any reviews, and cannot get any reviews without jobs [6]. The paper published in Journal of Management Information Systems highlights that although the catalog structure of gigs helps with the discovery of freelancers on Fiverr, at the same time, it limits them in their ability to provide services with higher complexity [7]. De Stefanos legal-economics analysis of the "just-in-time" workforce model suggests that the platform-based commission models put all risks on shoulders of

workers while still keeping the price-making power of the platform [8]. Sundararajan provides an analysis of the wider phenomenon of sharing economy, where the above mentioned tendencies occur in the context of migration to the peer-to-peer digital markets. noting that trust infrastructure — not just matching efficiency — is the binding constraint on platform growth [9].

II. AI AND MACHINE LEARNING FOR SKILL-BASED JOB MATCHING

In order to resolve issues associated with matching in the process of talent discovery, a lot of researchers have used intelligence and natural language processing techniques. Le et al. propose utilizing recommendation system that includes Content-Based Filtering where NLP models such as Word2Vec or BERT are employed for calculating the similarity between resumes and job description with Collaborative Filtering taking into account behavior of similar users [10]. Previously, Horton studied the functioning of labor markets and identified a lack of matching as one of the most significant causes for inefficiency of these markets. Minor improvement in the matching process may result in considerable increases in compensation of workers and client satisfaction [11]. Agrawal, Horton, Lacetera and Lyons went further. They considered labor market as a two-sided matching problem. It was shown that information asymmetry. Rather than the size of the labor pool. Represents a barrier for efficiency [12]. Deep learning techniques have been recently applied as a substitute for simple keyword matching. It is demonstrated that transformer-based models outperform traditional techniques such as TF-IDF and cosine similarity in terms of precision and fairness in all skill domains [13]. The main limitation that repeatedly appears is known as the "cold-start" problem. In order to apply collaborative filtering, information about past behavior of users is required. Since new users do not have any history, they receive recommendations even if they are highly skilled [10] [13].

III. BLOCKCHAIN, SMART CONTRACTS, AND DECENTRALIZED TRUST

With blockchain, there is a trust mechanism which uses code to enforce agreements instead of relying on any centralized authority. This change is very significant, in my opinion. The Nakamoto's peer-to-peer electronic cash system became the first implementation of a trustless, ledger [14]. The concept of contracts was formally introduced by Szabo who predicted the self-executing agreements encoded into software [15]. In his Ethereum whitepaper, Buterin made this concept become a general-purpose contract system where any escrow and settlement logic could be implemented [16]. Wattenhofer studied the escrow using blockchain technology. It was found out that smart contract settlement decreases

transaction fees from the usual 3–5% of the centralized escrow to practically zero gas cost [17]. Zheng et al. reviewed blockchain problems and presented trade-offs like scaling and gas fee volatility during network congestion and the perennial oracle problem – difficult as it is to feed real-world data events (e.g., proof of work completion) into a trustless contract [18]. DID research emphasizes that user-owned portable reputational data, which is not linked to the databases of one platform, is critical to avoid ghosting and non-payment issues found in gig economy studies [17] [18]. Catalini and Gans conducted an economic analysis of blockchain adoption. Proposed that the primary benefit of blockchain technology is not in doing away with intermediaries but in reducing the cost of establishing trust among strangers, and this directly applies to the freelancer-client relationship [19].

IV. GAMIFICATION AND TOKEN ECONOMIES FOR ENGAGEMENT

Research has also explored the area of designing token-based incentive structures to influence user activity on digital platforms. Deci and Ryans Self Determination Theory informs that autonomy, competence, and relatedness are the primary factors that drive motivation, providing the necessary psychological framework for gamified design solutions [20]. According to Conners' study of "play-to-earn" models, tokens with financial value make users more loyal than cosmetic gamification solutions, such as badges and levels [21]. Voshmgirs tokenomics theory further expands the idea by introducing an important distinction between utility tokens, which provide users with certain functionality, and governance tokens, which grant decision-making powers to users; according to the researcher, properly designed utility tokens could substitute monetary rewards in two-sided early-stage markets where cash is scarce [22]. Rosenblats and Starks research on management in ride-hailing platforms warns about potentially dangerous consequences of badly-designed incentive schemes, which would seem to empower employees but actually limit their freedom – indicating the necessity of designing tokens to support freelancers needs, not just to favor the platform's interests [23].

V. COMPARATIVE SYNTHESIS AND RESEARCH GAP

A summary of the domains reviewed and problems encountered is given in Table I. Trust & Payment Security. There is research done on this problem in relation to blockchain escrow [14]–[19], but very seldom it is used in combination with matching and engagement components. Newcomer Discoverability. There is research done on this problem with regard to AI matching [10]–[13], but collaborative filtering approach is still unable to help newcomers with no history. Sustained Engagement. There is research conducted on the problem of sustained engagement

with regard to token economies and gamification [20]–[23]. Very seldom is there any connection with verification of skill development or payment system. Platform Fee Efficiency. This problem is identified throughout gig economy literature [1] [5]–[8] and blockchain solution is suggested [17]. In all four areas, there is no system reviewed that has the combination of AI-driven matching, blockchain-based trustless settlement, and incentive-aligned token economy in the same architecture. The most popular recruitment systems which possess AI-based matching capability operate in the B2B sector as software-as-a-service solution for business recruitment rather than as part of freelancing marketplace [10], [13]; there are several blockchain-based freelancing platforms such as Ethlance which resolve the trust problem, however, they do not have sophisticated matching capabilities and low usability [17], [18]; finally, there are only theoretical works in relation to token economies as well as their application only in gaming industry, not professional labor market [21], [22]. All these gaps form the basis of the 2GATHERS platform that is intended to address.

VI. CONCLUSION

The review provides scientific data on the social aspect of the gig economy, artificial intelligence used in matching workers and gigs, the blockchain technology that ensures trust between parties and the tokenization that incentivizes users' participation. Each of those components has a number of effective and well-tested strategies. From the results of the review, it is evident that there are no existing platforms for freelancers, whether a business or educational project, which incorporates all three of the key components. The absence of such is a reason why we have developed the 2GATHERS platform that incorporates an AI algorithm assisting newcomers in finding work, the blockchain-based financial transactions and tokenization that encourages development.

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