PEĪRA – A DECENTRALIZED SOCIAL SCIENCE NETWORK FOR RESEARCH AND APPLICATION

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ABSTRACT

Over the past two decades, social science researchers have increasingly turned to online platforms to recruit participants and conduct surveys. However, these platforms are only confined to certain demographics, restricting their uses mostly in WEIRD societies. Enter PEĪRA – a decentralized network that harnesses the power of Decentralized Autonomous Organizations for crowdsourcing and leverages blockchain technology for seamless payment, making localized participant recruitment possible across the globe. Peira also offers state-of-art tools, enabling new data collection methods for the expanding methodological needs of modern research, and supporting easy conversion of academic findings into commercial applications. Together, Peira makes social science research more accessible, capable, and impactful.

INTRODUCTION

At the heart of the social sciences lies the endeavor to understand and predict human behavior and social interactions. In order to have a thorough analysis and establish any effective or robust social science theory to explain phenomena, researchers need to mobilize people from diverse backgrounds to collect comprehensive data from them. Whether through interviews, surveys, questionnaires, experiments, or other methodologies, this process is critical to generating the empirical evidence necessary for meaningful insights and advancements in the field.

Prior to the advent of the internet, recruiting research participants was a labor-intensive and often restrictive process. Researchers frequently relied on convenience or snowball sampling methods, particularly targeting individuals in proximity to university campuses. Consequently, samples were predominantly drawn from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies, raising concerns about the generalizability of findings to populations in other cultural or socioeconomic contexts (Henrich et al., 2010). Furthermore, the

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in-person nature of research at the time imposed significant limitations on study design, including the size of participant pools, the duration of studies, and the breadth of data that could be collected (Horton et al., 2011).

In response, many social science researchers have turned to online crowdsourcing platforms such as Amazon Mechanical Turk, Prolific, and Qualtrics to recruit participants (Cheung et al., 2017; Peer et al., 2017; Buhrmester et al., 2018; Palan & Schitter, 2018). These platforms have undoubtedly facilitated the recruitment process from a larger participant pool. However, recent studies have highlighted several limitations. Platforms like these often have a restricted participant base (Stewart et al., 2015) and tend to overrepresent certain ethnic and geographic groups (Peer et al., 2017). As a result, these platforms are mostly serving the WEIRD societies, and research institutes in other parts of the world often need to rely on traditional recruitment methods to obtain local data. Additionally, the cost of acquiring participants through these services is exorbitant. For example, Prolific is charging at least 33% on top of the participant rewards for using the platform (Prolific, 2024).

Another limitation of these platforms is their confinement to traditional methods, such as surveys and questionnaires, which fails to meet the expanding methodological needs of researchers. For instance, modern research increasingly demands capabilities such as mobile sensing method and behavioral data tracking via smartphones (Stachl et al., 2020; Schoedel et al., 2023); support for multi-participant interactions and complex experimental designs (Almaatouq et al., 2020; Becker et al., 2022); and the ability to conduct large-scale qualitative interviews using large language models (Xiao et al., 2023). To address these gaps, researchers have independently developed specialized tools such as the PhoneStudy app (Stachl et al., 2023) and Empirica (Almaatouq et al., 2021). However, these innovative efforts often operate in silos and remain underutilized within the broader research community. This lack of awareness of available tools limits researchers, compelling them to engage in less innovative, more routine studies or, at best, to redundantly develop similar tools, leading to wasted time and resources. Such inefficiencies ultimately hinder the pace of scientific advancement.

Furthermore, as in many other fields, social science research is frequently criticized for its lack of real-world applicability. While certain studies hold significant practical value, the persistent gap between academia and industry often impedes the translation of theoretical insights into actionable applications (Cummings, 2007). This disconnect limits the broader societal impact of social science research and curtails its potential to address pressing real-world challenges effectively.

PROBLEM STATEMENT

We propose the following problem statement for social science research, summarizing the key issues highlighted in the preceding section. In addition to challenges around participant recruitment, methodological fragmentation, and practical applicability, we include other concerns related to collaboration, data privacy, and integrity. These problem areas are outlined in Table 1 below.

Table 1. Social Science Research Problem Statements

	Problem Statement
Participant Diversity	Current platforms fail to recruit large numbers of participants from diverse demographic backgrounds. This, in particular, has hindered research development in non-WEIRD societies which prioritize localized data for greater relevance and accuracy. This may also create a mismatch between the demographics of sampled participants and the target population.
Recruitment Cost	Exorbitant fees on established platforms hinder research scalability and limit sample size expansion.
Fragmentation	The absence of a unified research platform leads to operational inefficiencies and increases the risk of data integration errors. Fragmented tools also result in low visibility and adoption, limiting their overall impact across the research community.
Practicality	Social science research is frequently criticized for its lack of real-world applicability, with significant barriers to transforming research outputs into practical applications.
Collaboration	From survey design to data analysis and from literature review to manuscript preparation, researchers face significant challenges in collaborating efficiently with other research groups using conventional communication platforms (e.g., email).
Data Integrity	Due to insufficient data transparency, scientific research faces a growing replication crisis, with recent cases of data manipulation involving even highly reputable researchers from prestigious institutions (Lewis-Kraus, 2023).

SOLUTION – PEĪRA

In light of the aforementioned challenges, we introduce Peira. Derived from the ancient Greek word πεῖρα, meaning trial, experiment, or endeavor, Peira embodies the spirit of discovery and innovation. Our vision is for Peira to become a comprehensive social science ecosystem and platform accessible to everyone—whether you are a casual user seeking to support and engage with these efforts, a researcher conducting studies, or an academic turned entrepreneur wishing to commercialize your research output.

Peira leverages two key innovations—blockchain technology and Decentralized Autonomous Organizations (DAOs)—to address the crowdsourcing and participant recruitment challenges outlined earlier. The advent of blockchain has introduced a transformative mechanism for conducting digital transactions without the need for trusted intermediaries (Catalini and Gans, 2020). This capability allows researchers to efficiently distribute rewards to participants

via cryptocurrency or stablecoins, making it cheaper, faster and more accessible (Broner, 2024). Moreover, the decentralized and permissionless architecture of blockchain attracts a vibrant and diverse Web3 community from around the globe, granting researchers access to a broader demographic range that has traditionally been difficult to reach. This also enables research institutes to recruit local participants when required, a key factor in many social science studies.

Decentralized Autonomous Organizations (DAOs) are organizational structures that leverage blockchain and related technologies to allocate resources, coordinate activities, and facilitate decision-making (World Economic Forum, 2023). The co-ownership model inherent in DAOs instills a sense of belonging among participants and nurtures a collaborative community united around advancing social science research. It also provides a channel for participants to voice out their concerns, and prevents platform owners from exploiting them by unilaterally changing terms and rights (Chen et al., 2022; Jennings, 2025). We believe that DAO provides an effective organizing structure that can increase the engagement and sustainability of a community dedicated to research crowdsourcing.

To achieve its mission, Peira will be structured into two interlinked sub-platforms. The **Peira Research Hub** will provide research tools and a robust data management system tailored for researchers. The **Peira Participant Hub** will crowdsource members for their active participation in research and governing the platform.

Peira Research Hub. The platform is envisioned as a one-stop, integrated solution for social science researchers to initiate and conduct end-to-end research study. It allows researchers to easily crowdsource participants, provide tools for different experiments and data needs, allow for easy research commercialization while keeping all the data private and secure. It aims to provide comprehensive support to researchers at every stage of their research journey.

Peira Participant Hub. This platform will be structured as a Decentralized Autonomous Organization (DAO) owned and governed by a decentralized, diverse participant community. This community will consist of individuals from around the globe who share a common goal of advancing science. Members can contribute in multiple ways: participating in surveys or experiments, funding commercialization ideas, and, most importantly, engaging in the governance and contributing to the operation of the platform.

Table 2. Features of Peira Research Hub

	Research Hub
Crowdsourcing	• Enables researchers to recruit a large number of participants and collect data in various formats. • Eliminates geographical and institutional barriers, providing access to diverse and representative participant pools. • Allows researchers to recruit local and non-WEIRD participants effectively when required. • Leverages Web3 technology to create an ecosystem where researchers and participants collaborate for mutual benefits.
Payment	• Participants can earn rewards in fiat (via payment service providers), cryptocurrency, or both[2], anywhere in the world.
Data Collection	• Goes beyond traditional surveys, supporting qualitative interviews (via video calls or LLMs), interactive experiments, and mobile sensing method (MSM) such as behavioral or biometric data tracking (mobile or wearable devices). • Acts as a centralized repository for storing, managing, and sharing datasets and findings.
Privacy	• Ensures participant anonymity by encrypting and securely storing data, unlinking individual identities from data inputs.

Table 3. Features of Peira Participant Hub

	Participant Hub
Participation	• Users can participate in surveys or experiments and earn rewards. • PEIRA token holders automatically become DAO members, gaining the ability to voice their opinions and vote on key decisions.
Governance	• Peira DAO members will decide on the key hires for the DAO and monitor their performance. • All major decisions or actions of the DAO will be written down, and all DAO members are invited to give feedback or suggestions. • Members have the authority to vote on the allocation/use of Peira's treasury funds.
Task Contribution	• Peira DAO may issue tasks that invite everyone to contribute. Participants may self-select into tasks and earn rewards accordingly.
Commercialization	• Peira DAO members may vote to support commercialization ideas, and subsequently invest in those ideas (contingent on satisfactory progress).

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[2] Despite the early focus on crypto-based rewards, Peira will also partner with payment service providers to establish distribution channels on fiat currencies.

TECHNOLOGY

The creation of Peira—a secure, transparent, and incentivized decentralized network for social science research—requires a robust technology architecture that prioritizes privacy, integrity, and collaboration. Below, Table 4 outlines the core technologies which enable the Peira platform. Then, Table 5 explains the user roles within Peira's Research Hub, detailing their responsibilities and contributions, followed by the platform's architecture in Figure 1.

Table 4. Peira Technology Stack

Research Hub	
Human-Test	• A facial liveness verification (Jain et al., 2006) is required upon account registration. • At a minimum, the participant must provide the same unique passcode that they received during registration to participate in the experiment. At a higher security level, the participant would receive a verifiable token during registration, which they must use to authenticate their access to the experiment. At the highest security level, if deemed necessary by the Researcher, the Participant must also pass a Human test based on Zero Knowledge Test (ZKT) technology to prove that they are the same unique person who registered for the experiment.
Token	• With Peira DAO's approval, PEIRA tokens may be airdropped to the participants of certain whitelisted research, provided that they have linked their account with a web3 wallet address. • As the platform grows in popularity, multiple researchers may compete for participants' attention. To address this, Peira will rank research projects based on the amount of PEIRA tokens staked. Anyone, including the researcher and community members, can stake their own tokens towards any research they find valuable.
NFT	• Upon completion, participants will be granted a soul-bound NFT. • A cryptographic hash will be included in the participation NFT. This prevents bad actors from tampering and hence ensures the research's data integrity.

Participant Hub	
Token	• PEIRA tokens are used for governance and operational voting within the Peira DAO, covering decisions such as hiring or removing staff, setting strategic directions, introducing new product features, and managing the treasury. • PEIRA tokens can be used as incentives to drive platform adoption in its early stages, helping to bootstrap engagement and growth within the ecosystem.

Table 5. Peira Research Hub User Roles

User	Description	Roles
Project Owner	Provides research topics and oversees the final results.	The Project Owner sets the research topic, selects the experiments, and reviews the results of the experiment. The Project Owner provides updates on project progress and manages access rights to research-related outputs. A Researcher may share the role of Project Owner, and propose research topics.
Sponsor	Reviews the proposed research topics and experiments, and decides which ones to fund.	The Sponsor can be an individual, or an organization / committee who makes selection and funding decisions collectively. When applicable, the Sponsor holds the funding and acts as the authority over fund distribution and approval of execution of selected experiments. They disburse the rewards upon conclusion of the experiment.
Researcher	Designs experiments, screens participants, and coordinates data collection according to chosen research topics.	After a research topic is chosen by the Project Owner and approved by the Sponsor (when applicable), the Researcher formulates hypotheses, designs the experiment, and submits a research proposal for approval. Upon approval, the Researcher proceeds to recruit participants, and they ensure that the data collection process adheres to ethical standards and privacy guidelines.
Reviewer	Peer reviews research proposals and experiment designs.	This is an optional role where Researchers can invite Reviewers (either open or blind) to give comments and feedback on the research proposal or experiment designs. Researchers can make use of the feedback to improve their research project. Alternatively, Sponsors may require researchers to conduct a review before funding approval.
Analyst	Analyzes experiment data, tests hypotheses, and provides results.	Analysts perform statistical analyses based on the hypotheses with the assistance of the Oracle when needed. Multiple analysts can perform exploratory analyses in parallel upon the same set of participant data. Unless exempted under the banner of academic research, all data are anonymized, preserving participant privacy. A Researcher may share the role of an Analyst.
Participant	Enrolls and participates in research experiments, and provides experimental data.	Participants securely submit their data to the platform in exchange for rewards (fiat or web3 token). Their data (such as data from behavioral tracking tools) is kept private, encrypted, and secured throughout the process.

Figure 1. Peira Research Hub Platform Architecture
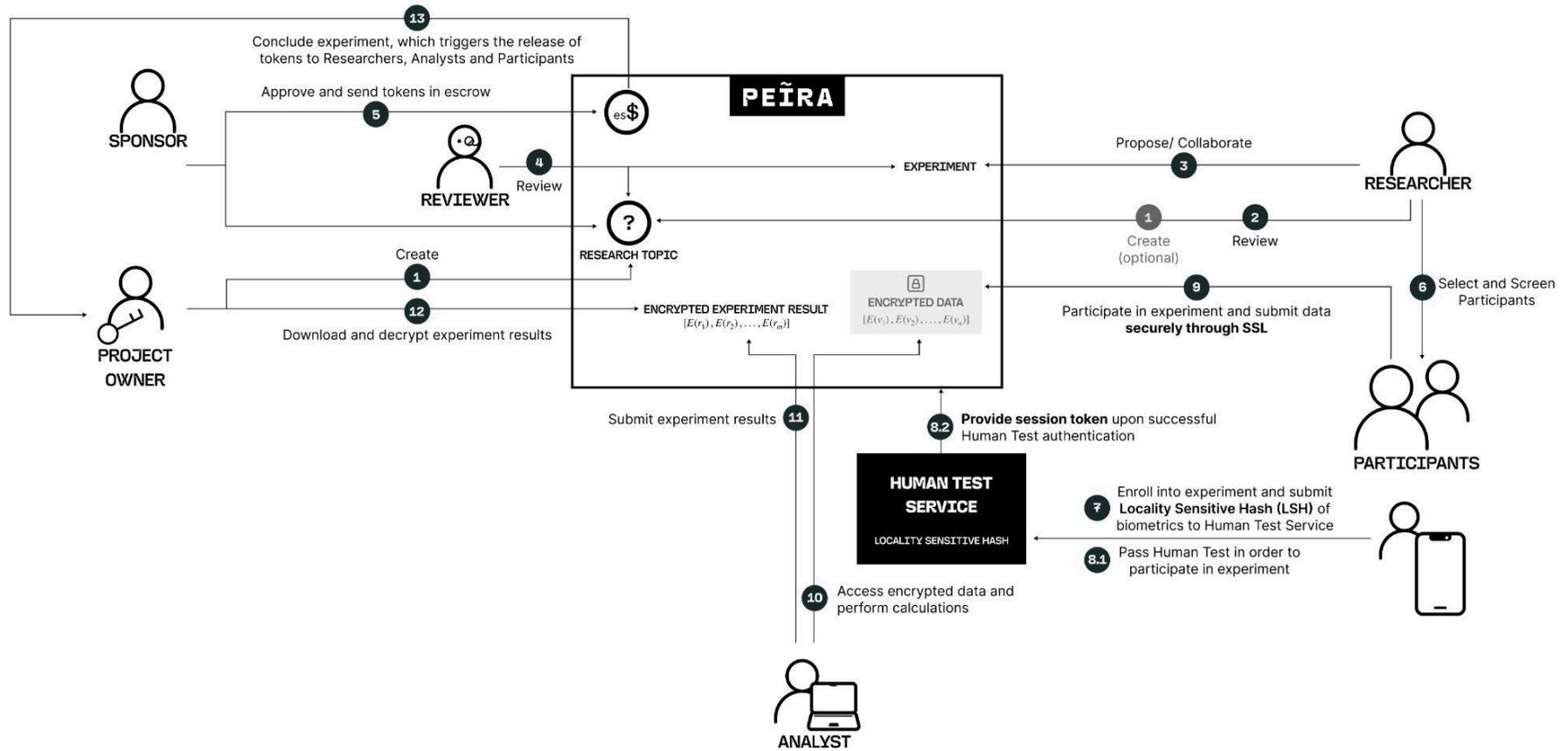
PRIVACY

Peira prioritizes data privacy and upholds rigorous ethical standards. Unless exempted under the banner of academic research, participants' sensitive data is encrypted and anonymized to ensure that their identities and personal information remain secure. Biometrics used in human tests are stored securely on the keychain of each participant's personal mobile device and are accessible to the system solely through zero-knowledge technology, further safeguarding privacy.

Peira also adheres strictly to key principles of the **General Data Protection Regulation (GDPR)**, including **data access**, **data deletion**, and **data minimization**, ensuring compliance with international data protection standards.

Figure 2. Peira's Privacy Protection

Data Access	Data Deletion	Data Minimization
Participant's sensitive data is encrypted before it is stored on the system. Upon request, the system will first authenticate the requestor's identity, then decrypt and send the data to the requestor.	Participants can request the deletion of their personal data if it is no longer required for its original purpose or if consent is withdrawn. The system authenticates the requestor's identity before securely deleting the data.	The platform collects only the data necessary for the specified purposes. All data is encrypted, minimizing the potential for excessive data retention or unintended processing outside the prescribed scope.

Notably, the Peira Research Hub is built using a traditional server-client architecture rather than blockchain. This design choice ensures compliance with GDPR requirements, as blockchain's immutability can hinder data deletion and compromise participants' privacy. Blockchain is primarily utilized within Peira as an incentive layer (for participant rewards and crowdfunding) and as a governance system (Peira DAO). All blockchain interactions are conducted using users' public wallet addresses, keeping them fully anonymized and detached from their Peira Participant Hub accounts.
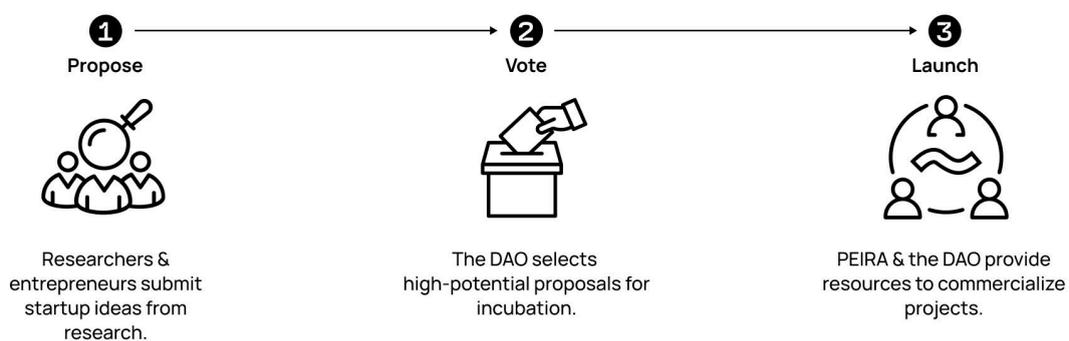
Lastly, data will only be collected and stored on the Peira server for the purposes explicitly specified by the researcher. The ownership of the data rests with the researcher (or his/her affiliated universities or organization) while Peira acts solely as a data processor. If required, Peira can also provide an on-premise setup, ensuring that the data remains confidential and private within the organizations conducting the studies.

COMMERCIALIZATION

While the lack of real-world applicability in academic research is widely acknowledged, persistent systemic barriers continue to hinder progress in social science commercialization. A primary challenge lies in the fundamental need for human-centric data to validate hypotheses and test market demand, for which no streamlined infrastructure currently exists. Compounding this issue, many social science researchers lack the technical competencies required for business development, such as programming or product design skills. Furthermore, as demonstrated by Braesemann and Marpe (2023), social science startups face significantly greater obstacles in securing funding compared to STEM ventures, creating an uneven playing field for innovation.

As Peira grows, we will roll out a commercialization platform supporting social science startups. The process begins with researchers and entrepreneurs submitting proposals supported by academic citations and empirical evidence, which are then evaluated through a decentralized DAO voting mechanism. Proposals that meet established thresholds enter an incubation phase where the Peira team provides hands-on support across multiple dimensions, including team assembly, legal structuring, and product-market validation through the platform's integrated crowdsourcing capabilities. Successful projects may progress to a crowdfunding phase, where DAO members can invest while simultaneously serving as early adopters.

Figure 2. Peira's Commercialization Pathway

1 Propose	**2** Vote	**3** Launch
Researchers & entrepreneurs submit startup ideas from research.	The DAO selects high-potential proposals for incubation.	PEIRA & the DAO provide resources to commercialize projects.

Peira's commercialization platform addresses all the key challenges faced by social science startups. It offers the necessary infrastructure for startups to validate market demand (DAO voting) and collect the data needed for starting their business (crowdsourcing). The incubation process also helps researchers (entrepreneurs) accelerate their progress towards a minimum viable product (MVP). Lastly, crowdfunding allows these startups to raise the necessary funds for initial growth, and amass early supporters and users with ease.

By implementing this framework, Peira serves as a catalyst for transforming theoretical research into tangible impact. The platform not only lowers barriers to entry for researcher-entrepreneurs but also fosters meaningful collaboration between academia and industry. In doing so, it addresses the longstanding disconnect between social science research and real-world application, creating new pathways for knowledge to drive innovation and societal benefit.

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ECONOMICS

Peira will function as a Web2 and Web3 hybrid entity, strategically combining the benefits of both models. The Research Hub will utilize a Web2 infrastructure, ensuring convenient onboarding for researchers, greater compliance with GDPR and other regulations, and enhanced flexibility in designing mobile app features. Additionally, Peira plans to register an incorporated legal wrapper, which will provide limited liability for all Peira DAO members and streamline fiat-to-crypto on/off ramp processes (World Economic Forum, 2023).

Peira has three main sources of income – Researchers' **subscription fees**, **spotlighting fees**, and **ownership of commercialized projects**.

Subscription fees. Researchers will need to subscribe to use the Peira Research hub, which grants them access to tools such as smart phone data tracking or collaborative programming tools provided by the platform. Different subscription tiers may be offered depending on usage and frequency.

Spotlighting fees. To effectively recruit participants, researchers are encouraged to pay an optional participation fee to research participants. The Peira DAO may also vote to subsidize specific research projects using status points or PEIRA tokens. Additionally, researchers may opt to pay a spotlighting fee, where Peira will assist in promoting their studies, especially to their targeted demographics.

Ownership of commercialized projects. Researchers may submit commercialization ideas to Peira DAO. Upon successful incubation, the DAO may obtain stakes in those projects, either in the form of equity shares or tokens. Should the project become a commercial success, the DAO may benefit and monetize from it.

Figure 3. Peira's Sources of Income
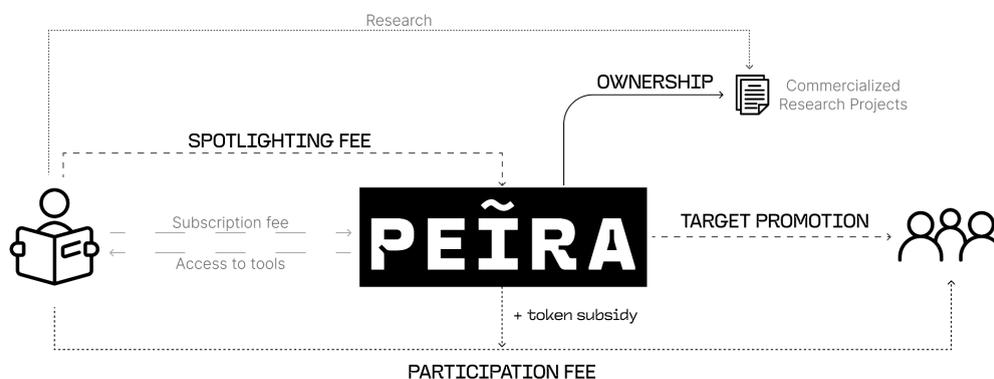
POTENTIAL USE CASES

By leveraging Peira's advanced capabilities, researchers can design more innovative studies, while entrepreneurs can uncover new business opportunities. Below, Table 6 outlines a range of potential use cases that demonstrate Peira's versatility.

Table 6. Peira's Potential Use Cases

Potential Use Cases	
Predictors of Initial Attraction in Dating Apps	Peira can facilitate studies on dating app behavior by securely collecting and analyzing users' personality traits, preferences, and matching data. Researchers or entrepreneurs can employ complex, adaptive experimental designs to improve predictive models of initial attraction based on psychological factors such as socioeconomic status, personality traits, values, and interests.
AI Counselors for Telepsychotherapy	Peira enables the development of AI chatbots for conversational therapy by integrating user-trained data to refine therapeutic approaches. Researchers or entrepreneurs can collect user responses and feedback to train and improve AI counselors, improving the effectiveness of telepsychotherapy interventions.
Longitudinal Studies on Clinical Interventions	Peira supports multi-phase studies by integrating tracking devices to monitor biodata (e.g., sleep quality) over time, reducing attrition rates and improving the assessment of mental health interventions' effectiveness.
GIS for Urban Planning and Land-Use Analysis	Peira can securely collect GPS data from mobile devices, enabling researchers or entrepreneurs to understand user movement patterns. This data informs urban planning decisions by identifying popular locations, optimising land-use strategies, and providing commercial value insights for businesses seeking targeted demographics.
Market Research	Expanding into foreign markets and conducting localized user research can be challenging. Peira, as a global research platform designed for large-scale, decentralized studies, offers a powerful solution. Its participant-friendly reward system fosters an ecosystem where users are incentivized to share valuable data—such as customer behavior insights. Researchers and entrepreneurs can then leverage these insights to develop better-targeted products and pricing strategies, tailored to local market needs.
AI Language Tutor	Understanding the language development process has been a research interest for linguistic and education studies. By comparing the learning style and data between people from different cultural backgrounds, educators can better understand their pain points and difficulties in picking up a new foreign language, and thus develop the most effective individualized program. Peira's decentralized ecosystem also allows researchers to access people around the world with different native languages, and collect data/feedback about their learning progress. A personalized AI tutor can then provide targeted language programs.
AI Speech Therapist	Employing acoustic analysis in human speech offers detailed insights into speech patterns, pitch, and intonation. Therapists can use this data to monitor progress in real time and tailor interventions based on empirical evidence—boosting treatment effectiveness and improving patient outcomes. By leveraging Peira's advanced data collection tools, researchers and entrepreneurs can develop an AI Speech Therapist product for both consumer (B2C) and institutional (B2B) applications, enhancing care quality and accessibility at scale.

CONCLUSION

Peira envisions the creation of a unified social science research platform that empowers researchers to efficiently crowdsource a diverse pool of participants while providing state-of-the-art tools for supporting new research methodologies.

We believe that science should not remain confined to the ivory tower. Peira aims to engage the general public in scientific progress and enable easy conversion of academic findings into practical applications.

The Peira crowdsourcing and commercialization platforms work collaboratively to serve researchers, entrepreneurs, and the public. Together, these platforms form a *decentralized social science network* dedicated to advancing scientific innovation and driving societal progress.

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