AGNOSTICA

Functional Requirements Document:

Decentralized Peer Review Platform (MVP)

A report produced by Agnostica, Ltd

https://agnostica.global

Robert Danielson, PhD
Alex James, MA

November, 2025

Functional Requirements Document:

Decentralized Peer Review Platform (MVP)

Identity and Access Management

- **FR-1:** The system shall allow users (authors, reviewers, editors) to authenticate via their ORCID accounts, linking each user's ORCID iD to their platform profile for single sign-on.

- **FR-2:** The system shall enable users to connect a Cardano wallet to their profile (e.g., through a Cardano wallet connector) so they can sign necessary transactions and receive payments on the platform.

- **FR-3:** The system shall implement role-based access control, supporting distinct user roles (e.g., Author, Reviewer, Editor/Moderator, Administrator) and ensuring each role can only perform authorized actions (for example, only Editors can assign reviewers or make publication decisions).

- **FR-4:** The system shall retrieve basic profile information from a user's ORCID (such as name and affiliation) upon login, with consent, to auto-populate the user's profile and credit their contributions under a verified identity.

Manuscript Submission and Storage

- **FR-5:** The system shall provide an interface for authors to submit manuscripts, allowing them to upload the manuscript file and enter relevant metadata (e.g., title, abstract, keywords).

- **FR-6:** The system shall store each submitted manuscript in a decentralized content storage network (e.g., IPFS), obtaining a unique content hash (CID) that serves as a permanent reference to the file.

- **FR-7:** The system shall record an immutable submission entry on the Cardano blockchain for each manuscript, including a timestamp, the content hash, and the submitting author's identifier, to serve as a tamper-proof proof of submission.

- **FR-8:** The system shall allow authors to track the status of their manuscript (e.g., "under review," "revision requested," "accepted," "rejected") via their dashboard, reflecting the current stage of the peer review process.

- **FR-9:** The system shall support the submission of revised manuscripts when an editor requests revisions, linking each revision to the original submission record for traceability. In such cases, a new content hash will be generated and logged (while maintaining reference to the prior version) to preserve an audit trail of changes.

Review Workflow

- **FR-10:** The system shall enable editors to assign one or more qualified reviewers to a submitted manuscript, inviting them to review. Upon assignment, the platform will notify the selected reviewers of the new review request.

- **FR-11:** The system shall allow an invited reviewer to accept or decline a review assignment. If the reviewer accepts, the manuscript is added to their queue; if declined, the editor is notified so they can select an alternate reviewer.

- **FR-12:** The system shall provide an interface for reviewers to submit their peer review reports, enabling them to enter structured feedback, attach files (if needed), and provide a recommendation (e.g., accept, minor revisions, reject) for the manuscript.

- **FR-13:** The system shall store each completed peer review off-chain and log a corresponding review record on-chain. Specifically, the full review content will be saved in decentralized storage (e.g., IPFS), and a cryptographic hash (along with metadata like the review ID and associated manuscript ID) will be recorded on the Cardano blockchain to timestamp the review and prove its integrity.

- **FR-14:** The system shall keep the content of reviews confidential during the active review process. Only the assigned reviewers and the editors/moderators of a manuscript shall have access to a manuscript under review and its submitted reviews, until an editorial decision is finalized. Once a final decision is made, the system shall release the relevant peer review reports to the author (and later to the public if the work is published) so that authors receive feedback at the decision stage.

- **FR-15:** The system shall allow a reviewer to specify their desired level of anonymity when submitting a review. If a reviewer opts to remain anonymous in public forums, the system shall record their identity internally (for credit and accountability) but will display the review under a pseudonym or label (e.g., “Reviewer A”) in any published context.

Incentives and Rewards

- **FR-16:** The system shall implement a rewards mechanism to incentivize reviewers, using ADA cryptocurrency micropayments as the reward. Upon the successful completion of a peer review (e.g., the review is submitted on time and deemed satisfactory by the editor), the system shall automatically trigger a predefined ADA payment to that reviewer’s account.

- **FR-17:** The system shall transparently record each reward disbursement. Every ADA reward transaction to a reviewer shall be linked to the specific review it corresponds to (e.g., via transaction metadata or an internal record tying the transaction ID to the review ID) so that the community and administrators can verify that rewards were distributed correctly.

- **FR-18:** The system shall notify reviewers when they have earned a reward for a completed review and provide instructions or prompts for accessing the reward. For example, if the reviewer has a wallet connected, they may be informed of the incoming ADA transfer; if not, the system will prompt the reviewer to connect a wallet or create one to claim the reward.

Reputation System

- **FR-19:** The system shall maintain a reviewer reputation score or similar metric for each user performing peer reviews, which reflects their contributions over time. This reputation score shall be **incremented or updated** each time the reviewer completes a review (especially for reviews that meet quality standards), and key reputation data will be stored in a tamper-proof manner (e.g., written to the blockchain as an aggregate score or embedded in the reviewer’s on-chain profile).

- **FR-20:** The system shall provide each reviewer with a public profile displaying their reputation information, including the number of reviews they have completed and any reputation score or level they have achieved. Authors and editors viewing a reviewer’s profile shall be able to see these

reputation indicators as a measure of the reviewer's track record and credibility.

Editorial Functions and Moderation

- **FR-21:** The system shall provide editors (or designated moderators) with the ability to review each submitted peer review for quality and compliance with guidelines. Editors can mark a review as **approved** (if it meets standards of constructiveness and completeness) or send it back for revision/clarification if it is inadequate, before considering it in the final decision or releasing a reward.

- **FR-22:** The system shall allow editors to render a final decision on each manuscript after the peer review process. An editor (or editorial committee) can set the manuscript's decision status to **Accepted (Publish)**, **Rejected**, or **Revise and Resubmit**, based on the content of the reviews and the manuscript's merit.

- **FR-23:** The system shall create an immutable record for each editorial decision on the blockchain, linking the decision to the manuscript and timestamping it. This on-chain decision record will include the outcome (e.g., accepted or rejected) and any relevant metadata, providing a transparent audit trail of editorial actions.

- **FR-24:** The system shall include a mechanism for authors to appeal or request reconsideration of an editorial decision. If an author believes a decision was unjust or wants a second review, they can file an appeal through the platform; the system will then notify the designated moderators or an advisory board member, and allow them to review the case and record the outcome of the appeal process.

- **FR-25:** The system shall enable moderators to enforce community guidelines and maintain academic standards on the platform. This includes the ability for editors/moderators to flag or remove inappropriate content (such as a manuscript or review containing offensive or non-academic material) and to disqualify or redact peer review comments that violate guidelines. All such moderation actions will be logged for accountability (either on-chain or in an admin audit log) to ensure transparency in how content policy is enforced.

Publishing and Citability

- **FR-26:** The system shall support the publication of accepted manuscripts as open-access scholarly articles on the platform. Once a paper is accepted, the platform will allow the final version to be marked as "published," making it publicly accessible to readers along with its metadata and reviews. This marks the completion of the submission's cycle from submission to peer-reviewed publication.

- **FR-27:** The system shall assign a **Digital Object Identifier (DOI)** to each published article to ensure it is citable in academic literature and easily discoverable. This will be accomplished by integrating with an external DOI registration service (such as Crossref or DataCite) via API or manual process, to register a DOI when a manuscript is accepted. The assigned DOI shall be stored in the article's metadata and displayed on the article's public page.

- **FR-28:** The system shall support open peer review for published works by **publishing the peer review reports** alongside the article. For each article that is published, all associated peer review reports will be made available to readers on the article's page. The system shall display the identity

of reviewers who have opted in to be named, or display an anonymous identifier for those who chose to remain anonymous, thereby giving reviewers credit while respecting privacy choices.

- **FR-29:** The system shall ensure long-term **persistency and accessibility** of published articles and reviews via decentralized storage. All published content (the article PDF/HTML and the peer review texts) will be stored in the decentralized storage network (e.g., IPFS) so that even if the platform's web interface is down, the content can be retrieved using its content hash. This design guarantees that once published, an article and its reviews cannot be lost or censored, and anyone can access them directly via the content hashes.

- **FR-30:** The system shall provide a clear reference to the blockchain records for transparency. On each published article's page (and/or in the author/reviewer dashboard), the system will show links or transaction IDs for the on-chain entries of the manuscript submission and the peer reviews. For example, it might display a message like "Submission recorded on Cardano at transaction XYZ on [date]" with a hyperlink to a Cardano explorer. This allows any user to independently verify the existence and timestamp of the submission and review records in the Cardano blockchain.

Administration and Security

- **FR-31:** The system shall enforce strict access controls to uphold confidentiality and role permissions. For example, only assigned reviewers and editors can access a manuscript under review (preventing unauthorized viewers), only editors can see author identities (if using blind review), and only administrators or editors can assign roles or alter submission states. These controls ensure users only access the information and functions pertinent to their role.

- **FR-32:** The system shall preserve user privacy by minimizing exposure of personal identifying information and supporting pseudonymity where appropriate. Real user identities (e.g., ORCID profile information) will not be placed on the public blockchain; instead, cryptographic identifiers or hashes will be used. Furthermore, if a reviewer opts to remain anonymous publicly, the system will hide their name in public outputs while still internally associating their ORCID and identity for record-keeping.

- **FR-33:** The system shall use a hybrid on-chain/off-chain design to protect data and ensure scalability. Only essential metadata and hashes are stored on-chain (to provide proof-of-existence and integrity), while all large or sensitive content (manuscript files, full review texts, user profiles) are kept off-chain. This approach not only keeps blockchain transactions lightweight and cost-effective, but also avoids exposing the full content of manuscripts or reviews on a public ledger.

- **FR-34:** The system shall provide administrative interfaces or tools for platform administrators to configure key settings and manage user roles. Administrators (or authorized personnel) will be able to add or remove editors/moderators, adjust reward parameters (such as the ADA amount per review), and update integration settings (such as DOI service credentials) as needed. Certain platform parameters and lists (e.g., the list of active moderators) may also be stored on-chain in a configurable manner to facilitate future decentralization of governance.

- **FR-35:** The system shall maintain any earned reviewer rewards in a **claimable balance** if a reviewer has not yet linked a personal wallet to the platform. In such cases, the reward will be recorded internally for that user. The user can later claim their accumulated ADA rewards by connecting a Cardano wallet, at which point the system will transfer the owed funds to that wallet.

This ensures reviewers don’t lose rewards even if they set up their wallet at a later time, while keeping the process secure and user-friendly.