

Appendix A. Detailed Technical Validation Report

Technical Validation of SREMAN: Cross-Database Bibliographic Import, Literature Screening, Data Export, Project Clearing, and Project-State Restoration

1. Overview

SREMAN (Systematic Reviews, Evidence Synthesis & Meta-Analysis Manager) is a browser-based literature screening and evidence-management application designed to assist researchers with bibliographic record import, screening, exclusion documentation, search tracking, data export, project backup, and project restoration.

The application uses persistent client-side browser storage and, for the tested local workflows, does not require a continuously connected central database. The application can also be used as a progressive web application (PWA), allowing it to be installed or added to a device home screen and used for local workflows without continuous network connectivity. Integrated PubMed retrieval is dependent on network access to the PubMed service/API and therefore represents an exception to the otherwise local/offline workflow.

This technical validation evaluated the principal functional workflows of SREMAN using real-world bibliographic files exported from multiple literature databases. The validation included large-scale bibliographic import, cross-database import using CSV and RIS formats, screening-data export and re-import, project backup and restoration, complete project clearing, repeated PubMed retrieval, modified/malformed CSV testing, and quantitative performance measurement.

The validation was conducted using SREMAN version 1 on October 7, 2026.

The principal large-scale validation project contained 30,963 article records accumulated through the validation workflows. The principal external PubMed dataset contained 6,645 records obtained from the PubMed search query “Leptin gene AND obesity.”

Original bibliographic files, exported project files, modified test files, JSON backup data, and supporting screenshots are provided as supplementary material to permit inspection of the validation workflow.

2. Objective

The objective of the validation was to determine whether SREMAN could reliably perform the following functions:

1. Import bibliographic records from external databases and integrated PubMed search retrieval.
2. Process CSV and RIS bibliographic formats.
3. Import records originating from multiple database sources.
4. Maintain bibliographic information during the screening workflow.
5. Record Include and Exclude screening decisions.
6. Record predefined exclusion reasons and free-text screening notes.
7. Export article-level screening data as CSV.
8. Export the broader project state as JSON.
9. Clear locally stored project data.
10. Restore a previously backed-up project following project clearing.
11. Handle modified or incomplete CSV input without generating unsupported bibliographic information.
12. Perform repeated literature-search and import workflows.
13. Process large datasets under the specified local hardware and browser conditions.
14. Measure execution times for selected application workflows.

The validation was intended to establish functional operation under defined test conditions. It was not intended to establish universal database interoperability, formal software benchmarking, clinical effectiveness, usability superiority, or equivalence to established systematic-review platforms.

3. Software Under Evaluation

Software: SREMAN

Version: Version 1

Developer: Vishnu Shivam

Organization: Vedanadhi

Testing date: October 7, 2026

SREMAN is a browser-based application using persistent client-side browser storage. Bibliographic and screening information is stored locally, while the application provides mechanisms for exporting article-level data and backing up the broader project state.

The evaluated version does not use automatic bibliographic deduplication. Duplicate records can be identified and excluded manually by the reviewer. The application includes “Duplicate” as an available exclusion reason in the evaluated version.

The evaluated screening workflow provides two principal screening decisions:

- Include
- Exclude

4. Test Environments

Functional testing was performed using the following environments.

The primary desktop validation environment was an HP laptop with 4 GB RAM running Windows 11 and Microsoft Edge version 154.0.4258.62. Additional browser testing was performed on an iPhone 17 running iOS 27.0.0 using Google Chrome version 154.0.8037.55 and Safari. The principal quantitative performance measurements were obtained using browser developer performance tools.

The tested workflows included application loading, PubMed retrieval, bibliographic import, screening, CSV export, JSON backup, project clearing, JSON restoration, and fresh-project import. The results demonstrate operation under the tested configurations but should not be interpreted as evidence of compatibility with every browser, operating system, device, browser configuration, storage environment, or future software release.

5. Validation Datasets and Supporting Files

The validation used original bibliographic files obtained from multiple sources.

The principal external sources were:

- PubMed
- Cochrane
- ClinicalTrials.gov
- ScienceDirect

The tested formats were:

- PubMed: CSV
- Cochrane: CSV and RIS
- ClinicalTrials.gov: RIS
- ScienceDirect: RIS

The principal PubMed export dataset contained 6,645 records and was generated from the query: “Leptin gene AND obesity”. This dataset was used primarily for large-scale external CSV import validation.

A separate integrated PubMed retrieval workflow within SREMAN was evaluated using the query: “5-HTTLPR AND suicide”. This retrieval returned 134 records and was used for integrated PubMed search/retrieval performance testing.

A further integrated PubMed retrieval using the query: “Vishnu Shivam” returned 6 records and was used as an additional retrieval validation workflow.

The final large-scale SREMAN project used during the validation contained 30,963 article records. This total represented the accumulated project state produced through the repeated import and retrieval workflow rather than a single source file containing 30,963 records.

The original source files and resulting project files are retained in the corresponding appendices.

6. Validation Workflow

Validation was performed through repeated functional cycles rather than a single import/export operation.

The principal workflow consisted of the following sequence:

1. Initial SREMAN application loading.
2. Measurement of initial application loading over three runs.
3. Integrated PubMed search and retrieval using the query “5-HTTLPR AND suicide,” returning 134 records.
4. Repeated large-scale import of the 6,645-record PubMed CSV dataset.
5. Import of the 571-record Cochrane CSV dataset.
6. Import of the 571-record Cochrane RIS dataset.
7. Import of the 176-record ClinicalTrials.gov RIS dataset.
8. Import of the one-record ScienceDirect RIS dataset.
9. Import of an 18-record modified/malformed CSV dataset.
10. Integrated PubMed search using the query “Vishnu Shivam,” returning six records.
11. Screening of selected records.
12. Export of article-level screening data as CSV.
13. Export of the large project as JSON.
14. Export of a PRISMA-style screening summary as CSV.
15. Complete project clearing.
16. Restoration of the project from the JSON backup.
17. Second project clearing.
18. Application reload.
19. Fresh import of the large dataset into an otherwise empty project.
20. Repeated fresh-import/clear cycles for quantitative performance measurement.

The workflow was completed successfully under the specified test conditions. A visual representation of the validation workflow is provided in Figure 1.

7. Functional Pass/Fail Criteria

A validation operation was classified as Pass when the application completed the intended operation and produced the expected observable result without an application-level failure.

Import:

An import was classified as Pass when:

- the selected file was accepted;
- the file was processed;
- the expected records were represented in the application; and
- no unexpected application-level import failure occurred.

Export:

An export was classified as Pass when:

- the requested CSV, JSON, or summary file was generated;
- the file could be accessed after export; and

- the exported information corresponded to information represented by the application.

Project clearing

Project clearing was classified as Pass when:

- the stored project information was removed; and
- the application returned to the expected empty-project state.

Project restoration

Project restoration was classified as Pass when:

- the backup file was accepted;
- the project was reconstructed; and
- the information represented in the backup was available after restoration.

Modified/malformed CSV testing

Modified-input testing was classified as Pass when:

- the altered file could be processed;
- missing information was not artificially generated; and
- the application did not produce an unexpected application-level failure.

Performance testing

A performance measurement was considered valid when:

- the operation completed successfully;
- three measurements were obtained under the same test conditions; and
- the measurements could be recorded and compared.

These criteria represent functional validation criteria and are not formal software-performance standards.

8. PubMed Validation

The principal external PubMed validation dataset consisted of 6,645 records obtained using the query: “Leptin gene AND obesity”. The results were exported directly from PubMed as CSV and subsequently imported into SREMAN.

This dataset was used to evaluate:

- large-scale CSV import;
- bibliographic record representation;
- integration of PubMed-derived records into the larger project;
- screening functionality; and
- downstream export and project-management functions.

Integrated PubMed retrieval

A separate integrated PubMed search/retrieval test was performed using the query: “5-HTTLPR AND suicide”. The retrieval returned 134 records.

The measured execution times for three runs were:

- 6.573 seconds
- 8.202 seconds
- 4.928 seconds

The arithmetic mean was 6.568 seconds, approximately 6.57 seconds.

A further integrated PubMed retrieval was performed using: “Vishnu Shivam”. This search returned six records and was used as an additional retrieval validation.

The 6,645-record external PubMed CSV dataset and the integrated 134- and 6-record retrieval workflows therefore served different validation purposes and should not be interpreted as a single dataset or as equivalent performance tests.

9. Cross-Database Import Validation

Cross-database import was evaluated using original bibliographic exports from PubMed, Cochrane, ClinicalTrials.gov, and ScienceDirect.

The tested formats were:

Source	Format	Records
PubMed	CSV	6,645
Cochrane	CSV	571
Cochrane	RIS	571
ClinicalTrials.gov	RIS	176
ScienceDirect	RIS	1

All tested files were successfully processed under the validation conditions.

SREMAN's CSV import mechanism uses application-defined fields. Because CSV structures differ between databases, users can align source-specific columns with the corresponding SREMAN fields before importing the file.

Therefore, the validation supports practical CSV interoperability with external databases when the source data are appropriately mapped to the SREMAN import structure.

The RIS importer was tested with files obtained from multiple sources and successfully processed the tested RIS files. The implementation accepts standard RIS-style tagged records and maps commonly used RIS fields to SREMAN bibliographic fields.

These findings support practical compatibility with the tested CSV and RIS files, rather than a claim of universal compatibility with every database export implementation.

The original source files are provided in Appendices B–F.

10. Large-Scale Project Validation

A large-scale project containing 30,963 article records was used to evaluate the application under a substantially larger local data load.

The accumulated project was subsequently used for:

- screening;
- CSV export;
- JSON project backup;
- PRISMA-style summary export;
- complete project clearing;
- JSON restoration;
- second clearing;
- application reload; and
- fresh import into an empty project.

The same large project therefore provided a basis for evaluating multiple stages of the local data lifecycle.

The 30,963-record total should be interpreted as the project-level record count generated through the validation workflow and not as a single external database export.

11. Screening Functionality

The evaluated version of SREMAN provides two principal screening decisions:

- Include
- Exclude

For excluded records, the reviewer can select a predefined exclusion reason.

The available exclusion categories include:

- Wrong population
- Wrong intervention
- Wrong comparator
- Wrong outcome
- Wrong study design
- Wrong setting
- Wrong publication type
- Not relevant
- Animal study
- Review article
- Conference abstract
- Duplicate
- No usable data
- Other

Because automatic deduplication is not implemented in version 1, Duplicate represents a manual screening/exclusion reason rather than an automatically generated duplicate classification.

Free-text screening notes can also be recorded.

Screening records can be filtered according to screening status, and navigation functions permit sequential review of the active screening set.

Keyboard shortcuts are provided to facilitate sequential screening. When the user is not actively interacting with an input, textarea, or selection field, the Right Arrow key advances to the next article, the Left Arrow key returns to the previous article, and the I and E keys assign Include and Exclude decisions, respectively. Keyboard shortcuts are automatically disabled while an editable form control is active to reduce unintended navigation or screening decisions during data entry.

12. Repeated PubMed Search Validation

Repeated PubMed searches were performed during the validation workflow to examine repeated search and retrieval operations.

Because the evaluated version does not perform automatic bibliographic deduplication, repeated retrievals should not be interpreted as evidence of automatic duplicate identification.

Instead, repeated searches were used to evaluate the application's ability to process successive PubMed retrievals and maintain the resulting project records.

Duplicate assessment in the evaluated version is a manual reviewer decision. The "Duplicate" exclusion reason may be used when a reviewer identifies a duplicate record.

The corresponding repeated-search project data are provided in Appendix K, and the workflow is demonstrated in Figures L6 & L7 in Appendix L.

13. Modified and Malformed CSV Validation

Robustness testing included an 18-record modified/malformed CSV dataset.

The file was deliberately altered by removing and/or modifying fields and columns before re-import.

The purpose was to determine how the application handled incomplete or altered bibliographic information.

When information was absent from the imported file, SREMAN did not attempt to reconstruct unsupported information. The corresponding field remained empty or unavailable.

This behavior preserves the distinction between information supplied by the source file and information that was not available in the input.

The modified/malformed file is provided in Appendix J, and the corresponding application state is demonstrated in Figure L5 in Appendix K.

14. CSV Export and Re-Import

SREMAN provides CSV export of article-level screening information. The exported data can contain bibliographic and screening fields represented by the application, including:

- PMID, where available;
- title;
- abstract;
- DOI;
- authors;
- journal;
- publication information;
- screening decision;
- exclusion reason;
- screening notes; and
- other supported screening fields.

The exported CSV was subsequently used for re-import testing following project clearing.

The article-level information represented in the CSV was successfully re-imported.

CSV should therefore be regarded primarily as a portable article-level screening-data interchange format, rather than as a complete project backup.

Information that is not encoded in the CSV cannot be expected to be reconstructed from the CSV alone.

15. JSON Project Backup

SREMAN provides JSON project-backup functionality.

The 30,963-record project was exported as a JSON backup.

The backup represented the broader project state required for project reconstruction following clearing.

The JSON backup operation was completed successfully.

The corresponding project backup is provided in Appendix G.

16. Complete Project Clearing

Complete project clearing was tested using the 30,963-record project.

The purpose was to determine whether locally stored project data could be removed and subsequently recovered from an external project backup.

Following project clearing, the application returned to an empty project state.

The previously generated JSON backup was then used for project restoration.

The successful restoration demonstrated that a valid JSON backup can function as a recovery mechanism following complete clearing of the local project.

17. JSON Project Restoration

JSON restoration was tested using the backup corresponding to the 30,963-record project.

The restored project reproduced the information represented in the JSON backup.

The restoration therefore demonstrated that JSON functions as a broader project-state preservation mechanism rather than merely as another bibliographic export format.

The restoration workflow is demonstrated in Figure L4 in Appendix L.

18. Fresh-Project Import and Repeated Import Testing

Following project clearing and application reload, the large dataset was imported into an otherwise empty project with no pre-existing data.

The repeated sequence was:

Load → Import → Clear → Import → Clear → Import → Clear

Three fresh-import performance measurements were obtained for the 30,963-record dataset:

- 20.258 seconds
- 20.212 seconds
- 23.606 seconds

The arithmetic mean was 21.359 seconds, approximately 21.36 seconds.

All three runs completed successfully.

19. Quantitative Performance Validation

Performance measurements were obtained using browser developer performance tools.

For CSV import, measurement began when application-side CSV processing commenced following file selection and ended when the import workflow completed and the success notification was displayed. User time spent locating and selecting the file was excluded. The measurements therefore represent application-side execution under the specified test conditions.

Table A1. Quantitative performance measurements

Operation	Dataset / condition	Run 1	Run 2	Run 3	Mean	Mean
Initial application	Initial load	29	24	21	24.67	0.025
Integrated PubMed	134 records; “5-HTTLPR	6573	8202	4928	6567.67	6.57
CSV import	6,645-record PubMed export	2381	2578	3155	2704.67	2.70
CSV import	571-record Cochrane export	3598	3383	4376	3785.67	3.79
RIS import	571-record Cochrane export	3101	3516	3857	3491.33	3.49
RIS import	176-record ClinicalTrials.gov	3715	3307	3524	3515.33	3.52
Summary statistics	Application summary	188	199	195	194.00	0.19
CSV export	30,963-record project	2930	3090	2918	2979.33	2.98
JSON backup	30,963-record project	3178	3131	2957	3088.67	3.09
Project clearing	30,963-record project	2436	2746	1987	2389.67	2.39
JSON restoration	30,963-record project	9474	12076	7894	9814.67	9.81
Fresh CSV import	30,963-record project; empty	20258	20212	23606	21358.67	21.36

The means are arithmetic means calculated from the three recorded runs. These measurements are specific to the tested hardware, browser, dataset, and application version. They should not be interpreted as universal execution-time benchmarks. The one-record ScienceDirect RIS import, the six-record integrated PubMed retrieval, and the 18-record malformed CSV test were not included in the quantitative performance table.

20. Functional Validation Summary

Table A2. Functional validation matrix

No	Validation	Test input/ condition	Expected outcome	Observed outcome	Status
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1 Initial	SREMAN version	Application loads	Application loaded successfully	P
2 Integrated PubMed	SREMAN integrated PubMed	Records retrieved successfully	134 records retrieved	P as
3 PubMed	Original PubMed	Records imported	6,645 records successfully processed/	P
4 Cochrane	Original Cochrane	Records imported	571 records successfully processed/	P
5 Cochrane	Original Cochrane	Records imported	571 records successfully processed/	P
6 ClinicalTri	Original	Records imported	176 records successfully processed/	P
7 ScienceDi	Original	Record imported	Record successfully processed/	P
8 Modified/malforme	Modified/malformed CSV;	Altered or incomplete information handled	Input handled successfully; missing/ altered information was not	P as
9 Repeated integrated	Repeated PubMed search workflow	Repeated search/ retrieval operations	Repeated search workflow completed successfully	P as
1 Screening	Selected project	Include/Exclude	Include/Exclude decisions functioned	P
1 Screening	Selected records	Free-text screening	Notes were recorded and retained	P
1 Exclusion	Excluded records	Predefined exclusion	Exclusion reasons were recorded and	P
1 CSV	30,963-record	Article-level screening	CSV export completed successfully	P
1 CSV re-	Exported	Article-level	Represented article-level information	P
1 PRISMA-	30,963-record	Screening-summary	Summary CSV generated	P
1 JSON	30,963-record	Project backup	JSON backup completed successfully	P
1 Project	30,963-record	Locally stored project	Empty project state achieved	P
1 JSON	JSON backup of	Project reconstructed	Project successfully restored	P
1 Fresh	30,963-record	Large dataset imported	Import completed successfully	P
2 Repeated	Three fresh-import	Large-scale import	All three runs completed successfully	P
2 Browser	Windows 11/Edge;	Principal workflows	Principal workflows operated	P

21. Cross-Database Validation Matrix

Table A3. External database interoperability testing

Source	Format	Records	Validation purpose	Result	Supporting appendix
PubMed	CSV	6,645	Large-scale external import	Pass	Appendix B
Cochrane	CSV	571	Cross-database CSV	Pass	Appendix E
Cochrane	RIS	571	RIS import	Pass	Appendix D
ClinicalTrials.gov	RIS	176	RIS import	Pass	Appendix C
ScienceDirect	RIS	1	RIS import	Pass	Appendix F

The results support practical interoperability with the specific source files evaluated. They do not establish universal compatibility with every bibliographic database or every CSV/RIS implementation.

22. Data Preservation and Restoration Findings

The validation demonstrated a functional distinction between CSV data interchange and JSON project backup.

CSV

CSV export represents article-level screening data. Following project clearing, the CSV could be re-imported and the information represented within the CSV was restored. Information not represented within the CSV was not expected to be reconstructed.

JSON

JSON backup represents the broader SREMAN project state. The JSON backup was created before project clearing and was subsequently used to restore the project. The successful restoration demonstrated that JSON provides a broader project-recovery mechanism than CSV screening-data export.

Accordingly:

CSV export/import: portable article-level screening-data interchange.

JSON backup/restoration: broader SREMAN project-state preservation and recovery.

23. Browser and PWA Validation

Functional testing was performed using Microsoft Edge on Windows 11 and Safari and Chrome on iOS 27.0.0.

The tested workflows included:

- application loading;
- local database initialization;
- bibliographic import;
- screening;
- filtering;
- navigation;
- CSV import/export;
- RIS import;
- JSON backup;
- JSON restoration;
- project clearing; and
- repeated large-scale import.

SREMAN also supports installation or addition to a device home screen as a progressive web application. The local application functions can therefore be used without continuous network connectivity once the application resources and local project data are available.

Integrated PubMed search and retrieval requires network access to the PubMed service and is therefore not considered an offline function.

The tested workflows operated successfully under the specified configurations. These results do not establish compatibility with all browser and operating-system combinations.

24. Supporting Appendices

Appendix A

Detailed technical validation report, including validation procedures, acceptance criteria, quantitative measurements, validation matrices, and interpretation.

Appendix B

Original PubMed CSV export containing 6,645 records generated from the query “Leptin gene AND obesity.”

Appendix C

Original RIS file exported from ClinicalTrials.gov containing 176 records.

Appendix D

Original RIS file exported from Cochrane containing 571 records.

Appendix E

Original CSV file exported from Cochrane containing 571 records.

Appendix F

Original RIS file exported from ScienceDirect containing one record.

Appendix G

JSON project backup corresponding to the 30,963-record project used for restoration validation.

Appendix H

PRISMA-style screening summary exported as CSV from the 30,963-record project.

Appendix I

Article-level screening-data CSV corresponding to the 30,963-record project.

Appendix J

Modified/malformed 18-record CSV used for input-validation testing.

Appendix K

Project JSON data corresponding to the repeated integrated PubMed-search validation.

Appendix L

Supplementary Screenshots Documenting Application States and Technical Validation Workflows

25. Supporting Figures in Appendix L

This appendix presents supplementary screenshots documenting the principal application states and technical validation workflows of SREMAN. The figures illustrate application initialization, PubMed record retrieval, cross-database bibliographic import, article screening, CSV export and import, JSON backup and restoration, validation of modified or malformed CSV files, and repeated PubMed searches. The validation workflows also document the handling of a large project comprising 30,963 bibliographic records.

Supplementary Figure L1. Overall SREMAN technical validation workflow.

Overview of the validation sequence, from application initialization through PubMed retrieval, cross-database import, article screening, data export, project clearing, JSON-based project restoration, and import into a new project.

Supplementary Figure L2. Initial application state of SREMAN.

Screenshot of the application in its initial empty or loading state before bibliographic records were loaded.

Supplementary Figure L3. CSV export and import of screening data for the 30,963-record project.

Screenshots documenting the export and subsequent import of article-level screening data associated with the 30,963-record project. Bibliographic records were imported from multiple sources as CSV or RIS files using SREMAN's standard import functionality. For CSV files, the column headers were required to match the corresponding SREMAN fields. The required field names can be identified from the CSV screening-data export shown in this figure; users can therefore replace database-specific headers with the corresponding SREMAN field names before importing the file. The workflow also includes records retrieved through integrated PubMed searches.

Supplementary Figure L4. JSON-based project backup and restoration.

Screenshots documenting the backup and subsequent restoration of the 30,963-record project using a JSON project file following the clearing of the application project. This workflow demonstrates the restoration of project data from the saved backup.

Supplementary Figure L5. Validation of modified and malformed CSV files.

Screenshots documenting application behaviour when processing deliberately modified, incomplete, or malformed CSV input files, providing evidence of input-validation procedures.

Supplementary Figure L6. Repeated PubMed searches and JSON-based project restoration.

Screenshots documenting repeated bibliographic retrieval through the integrated PubMed search functionality, together with the project information available following JSON-based backup and restoration.

Supplementary Figure L7. Additional validation and performance evidence.

Screenshots providing additional evidence of repeated PubMed searches and record retrieval within SREMAN, supplementing the validation workflows presented in the preceding figures.

The original files used during validation have been retained to facilitate independent inspection of the underlying data and verification of the documented workflows. These files provide supporting evidence beyond the screenshots and application-generated summaries.

26. Limitations

This validation has several limitations.

First, the evaluation was performed using SREMAN version 1 and a limited number of hardware, operating-system, and browser configurations.

Second, cross-database compatibility was demonstrated using the specific PubMed, Cochrane, ClinicalTrials.gov, and ScienceDirect files tested. It does not establish universal compatibility with every database or export implementation.

Third, the current version does not provide automatic bibliographic deduplication. Duplicate assessment therefore requires manual reviewer action. The “Duplicate” exclusion category is a manual screening option rather than an automatic duplicate-detection mechanism. More robust automatic duplicate detection is planned for a future version.

Fourth, the current version does not include a “Maybe” screening decision. Screening in the evaluated version uses Include and Exclude decisions.

Fifth, performance measurements were obtained using browser developer performance tools under specific test conditions. They represent empirical measurements of the tested configuration rather than universal performance guarantees.

Sixth, user file-selection time was excluded from CSV import measurements. The reported import values therefore describe application-side processing after file selection.

Seventh, the number of repeated performance measurements was limited to three runs per measured operation. Larger formal benchmarks involving additional hardware and controlled system conditions would provide stronger performance characterization.

Eighth, the validation was a functional technical evaluation rather than a formal usability study.

Ninth, no formal comparison with commercial or open-source systematic-review platforms was performed.

Tenth, SREMAN is not intended to replace systematic-review methodology. It does not independently establish search comprehensiveness, eligibility validity, risk of bias, certainty of evidence, or PRISMA compliance.

27. Conflict of Interest and Software Ownership

Vishnu Shivam is the developer of SREMAN (Systematic Reviews, Evidence Synthesis & Meta-Analysis Manager) and is the owner and operator of Vedanadhi, the organization under which SREMAN is developed.

The author therefore has a direct developer and ownership-related interest in the software evaluated in this technical validation.

SREMAN is currently provided without charge, and the author does not receive financial compensation or commercial revenue from its use. This relationship is disclosed to ensure transparency. The validation procedures were based on predefined observable functional outcomes and repeated test procedures. The results are supported by the original source files, exported files, screenshots, and project backups supplied as supplementary material.

28. Discussion

The present technical validation demonstrates that SREMAN can support a local browser-based workflow for literature screening and evidence management involving bibliographic records obtained from multiple external sources.

The principal large-scale validation involved a project containing 30,963 article records. The project was not used solely for an initial import demonstration; it was carried through multiple stages of the local data lifecycle, including screening, export, backup, clearing, restoration, and fresh import. The successful restoration following complete project clearing is particularly relevant to a browser-based application because locally stored project information depends on browser-managed storage. JSON backup provides an external representation of the project that can be used to recover the project state after local data are cleared.

The distinction between CSV and JSON is also technically important. CSV provides a portable representation of article-level screening data, whereas JSON provides broader project-state preservation. Users can therefore use CSV when they need to exchange or analyze screening records and JSON when they need to preserve and recover the SREMAN project state.

The cross-database tests demonstrate that SREMAN is not restricted to a single bibliographic source. Successful processing of the tested PubMed, Cochrane, ClinicalTrials.gov, and ScienceDirect files provides practical evidence of interoperability across different database sources and export formats.

However, the results should be interpreted within the tested scope. CSV structures vary between databases, and source-specific fields may require alignment with the SREMAN import fields. Similarly, RIS files may differ in the tags and metadata supplied by their originating platforms. Accordingly, the validation supports practical interoperability with the tested files rather than universal compatibility with every bibliographic database.

The modified CSV testing provides additional evidence of input handling. When fields were removed or altered, the application did not attempt to reconstruct information that was absent from the source file. This behavior is appropriate for evidence-management software because bibliographic completeness should reflect the information actually supplied by the source.

The performance measurements provide quantitative evidence that the tested local workflows operated at a scale exceeding 30,000 records. Under the specified Windows 11/HP laptop/Microsoft Edge configuration, the mean fresh-import time for the 30,963-record dataset was approximately 21.36 seconds, while the mean JSON restoration time was approximately 9.81 seconds.

These values are empirical measurements of the tested environment and should not be interpreted as universal benchmarks.

The current version also has clearly defined limitations. Automatic deduplication is not implemented, and duplicate records require manual assessment. Future development may introduce more robust duplicate detection using multiple bibliographic identifiers and bibliographic similarity. The application also does not provide synchronized multi-reviewer adjudication or a complete full-text systematic-review workflow. SREMAN should therefore be characterized as a literature screening and evidence-management tool rather than a complete replacement for systematic-review methodology or a comprehensive collaborative systematic-review platform.

The PWA architecture provides an additional practical feature by allowing the application to be installed or added to a device home screen and used for local project workflows without continuous network connectivity. Integrated PubMed retrieval remains network dependent.

29. Future Development

Based on the validation findings and current limitations, future development may include:

1. Robust automatic duplicate detection using multiple identifiers.
2. Bibliographic similarity matching for records without universal identifiers.
3. Improved handling of records without PMID.
4. Configurable CSV field mapping.
5. Additional database-specific import profiles.
6. Expanded RIS interoperability testing.
7. Full-text assessment functionality.
8. Multi-reviewer screening.
9. Blinded independent screening.
10. Reviewer disagreement adjudication.
11. Synchronization between devices.
12. Automated browser compatibility testing.
13. Larger-scale formal performance benchmarking.
14. Formal usability evaluation.

30. Overall Validation Conclusion

The technical validation demonstrated successful operation of the principal SREMAN workflows under the tested conditions.

The application successfully processed bibliographic files from the tested PubMed, Cochrane, ClinicalTrials.gov, and ScienceDirect sources using CSV and RIS formats where applicable. The principal external PubMed dataset containing 6,645 records was successfully imported, while integrated PubMed retrieval was separately demonstrated using searches returning 134 and six records.

A large SREMAN project containing 30,963 article records was subsequently used for repeated screening, export, backup, project clearing, restoration, and fresh-import testing.

Quantitative performance measurements demonstrated reproducible execution across three runs for the principal measured operations. For the 30,963-record project, mean measured times were approximately:

- **21.36 seconds** for fresh import;
- **2.98 seconds** for CSV export;
- **3.09 seconds** for JSON backup;
- **2.39 seconds** for project clearing; and
- **9.81 seconds** for JSON restoration

under the specified Windows 11/HP laptop/Microsoft Edge test environment.

The validation demonstrated that CSV and JSON serve different purposes. CSV provides portable article-level screening data, whereas JSON provides broader project-state preservation and recovery. Following complete project clearing, the JSON backup successfully restored the project state represented in the backup.

The cross-database tests support the conclusion that SREMAN can accept the specific bibliographic export files evaluated from multiple database sources. Modified-input testing further demonstrated that missing or altered bibliographic information was not artificially reconstructed.

The results therefore support characterization of SREMAN as a browser-based literature screening and evidence-management tool with demonstrated cross-database bibliographic import, local data processing, screening management, screening-data export, project backup, project clearing, and project-state restoration under the tested conditions.

The findings should not be interpreted as establishing universal database interoperability, universal browser compatibility, formal performance superiority, automatic deduplication, synchronized multi-reviewer functionality, or replacement of systematic-review methodology.

Within its demonstrated scope, SREMAN provides a lightweight local approach for researchers who require bibliographic import, screening management, portable screening-data export, and explicit preservation and recovery of project state.