Automated Technical Report Generation for Health Economic Models: A Comparative Case Study of Generative AI vs. Manual Development

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KEY MESSAGE

An AI pipeline auto-generated HTA-compliant technical reports from Excel models, reducing authoring time by ~80%. Accuracy was strong; expert review refined narrative quality.

BACKGROUND

Health Technology Assessment (HTA) submissions require model technical reports that synthesize clinical, economic, and methodological evidence. These reports play a critical role in informing reimbursement and policy decisions in a structured and transparent manner.[1,2]

Preparing such documentation is resource-intensive and must adhere to guidelines from organizations which emphasize transparency, reproducibility, and completeness. [3]

This study evaluated an **AI-driven system** for automated technical report generation from Excel-based cost-effectiveness models, benchmarking outputs against manual development across two predefined validation domains: **technical accuracy** and **editorial compliance.**

OBJECTIVE

1. **Technical Accuracy**
   Evaluate consistency with health economics principles, accuracy of data extraction from Excel, correctness of result and figure interpretation, and detection of unsupported or spurious technical statements.

2. **Editorial Compliance**
   Assess HTA-style compliance including automated front matter generation (table of contents, lists of tables/figures), caption and abbreviation legend accuracy, and adherence to predefined company-specific formatting templates.

METHODS

Two representative case studies were processed:

CASE 1	CASE 2
Partitioned Survival Model	Multi-state Markov Model

The system ingested Excel-based cost-effectiveness models, which were parsed into a structured machine-readable format enabling efficient querying of calculations, parameters, and results. Supporting documents were indexed using graph retrieval-augmented generation (RAG).

System Architecture: The system employed a multi-layered pipeline with distinct planning, writing, and post-processing stages. In the planning stage, a planner agent adapted predefined report outlines to project-specific data, incorporating uploaded models, structured input forms, and supporting documentation. The approved outline was then processed section-by-section by a writer agent that synthesized text, integrated numerical outputs, generated tables, and embedded figures with contextual interpretation. A post-processing layer standardized formatting, captions, abbreviation legends, and document-wide styles.

Human-in-the-Loop Checkpoints: The system incorporated formal hybrid intelligence at two stages: (1) outline review, where users could edit, reorder, add, or remove sections and map them to specific model versions; and (2) post-generation review, where section-level or full-document feedback could be provided for targeted or holistic regeneration. [4]

All outputs were independently reviewed by **senior health economists and medical writers** against two predefined validation domains: (a) technical accuracy and (b) editorial compliance.

RESULTS

~40h	<8h	≥80%
Manual drafting	AI-assisted	Time reduction

Authoring Time: Manual vs AI-Assisted (hours)

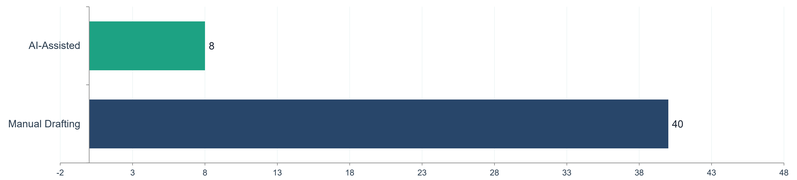


Fig 1: Authoring time for 1 report in manual vs AI assisted workflow for comparable output quality

Technical Accuracy Findings

- AI-generated reports accurately reflected model inputs and results from Excel across both case studies.
- No unsupported technical statements identified during independent expert review.
- Tables and figures correctly structured from extracted data; graphical outputs appropriately interpreted.
- Partitioned survival and Markov model outputs faithfully represented in the generated narrative. Structured data extraction ensured numerical consistency. Multi-source knowledge integration (model data, GRAG-indexed documents, structured input forms) produced contextually grounded explanations across all report sections.

Residual Issues Identified
Expert review identified limitations related to verbosity and stylistic refinement in certain narrative sections. Occasional over-explanation of standard methodological concepts was noted. Minor adjustments to stakeholder-facing language and contextual framing were required. The separation of planning and writing stages enabled targeted section-level revision without full-document regeneration..

KEY FINDING

Report development time reduced from ~40 hours (manual) to under 8 hours (AI-assisted) - an **≥80% efficiency gain** across both case studies. No unsupported technical statements were identified. All HTA editorial elements (TOC, captions, abbreviation legends, formatting templates) were auto-generated correctly, with expert review essential only for narrative refinement.

EDITORIAL COMPLIANCE

HTA Editorial Validation — Results by Element

Editorial Element	AI Output
Table of Contents	✓ Auto-generated
Lists of Tables & Figures	✓ Auto-generated
Captions	✓ Correctly applied
Abbreviation Legends	✓ Correctly applied
Formatting Templates	✓ Template-adherent
Narrative Style	✓ HTA compliant

DISCUSSION

AI-generated technical reports demonstrated **strong domain accuracy and HTA-compliant editorial quality** in two representative CE model case studies, while substantially reducing authoring time.

AI-driven automation can support the **standardization and scalability** of HTA report development. By reducing manual effort and minimizing transcription errors, such systems may enhance consistency and reliability in reporting while allowing subject matter experts to focus on higher-value analytical and interpretative tasks. The separation of planning, writing, and post-processing stages proved critical for coherence and traceability, enabling targeted section-level revisions without full-document regeneration.

Expert review remains essential to ensure narrative clarity, contextual appropriateness, and alignment with stakeholder expectations.

As HTA continues to evolve as a key tool for healthcare decision-making and resource allocation, the integration of AI-based solutions into report generation workflows may represent a significant step toward improving efficiency without compromising quality.

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