Evaluating Generative Artificial Intelligence (GenAI) in Health Technology Assessment (HTA) Content Generation: A Proof-Of-Concept Study Using Canadian Agency for Drugs and Technologies in Health (CADTH) Reimbursement Dossier Forms

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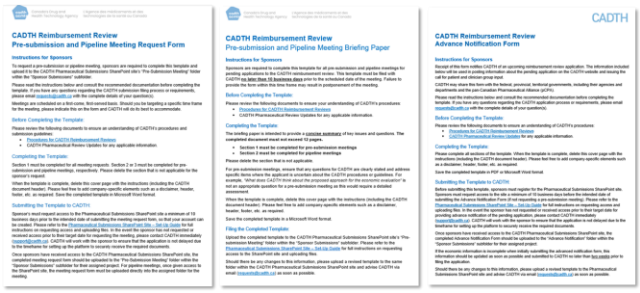
OBJECTIVES

- When submitting a Health Technology Assessment (HTA) in Canada, sponsors are required to complete three CDA (Canada's Drug Agency), previously CADTH, templates: Pre-Submission Meeting Request Form, Pre-Submission Meeting Briefing Paper, and Advance Notification Form (**Figure 1**), as part of the Canadian reimbursement process for new drugs. However, completing these forms can be time consuming.
- Generative Artificial Intelligence (GenAI) has the potential to assist in HTA content generation, ultimately saving human time and improving efficiencies.
- This proof-of-concept (PoC) study explored the use of GenAI in creating initial drafts of the reimbursement dossier forms submitted to CDA and investigated the potential for reducing time spent on HTA submissions.

Figure 1. CDA (previously CADTH) pre-submission templates

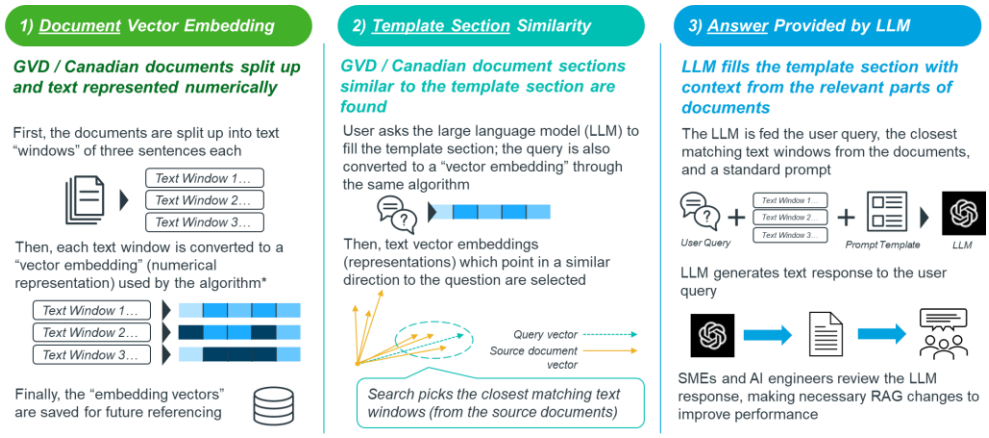


Source: CADTH (2023)[1, 2, 3]

METHODS

- For three separate drugs, subject matter experts (SMEs) in HTA mapped information from the respective global value dossiers (GVDs) to sections of CDA pre-submission forms using a traffic light system, to identify where GenAI (specifically OpenAI's GPT-4) could be used to draft sections:
  - Can be done by GPT
  - Cannot be done by GPT
  - Additional source required
  - No action
- Canada-specific documentation supplemented the evidence gaps, and further mapping revealed more sections that could be completed by GPT-4.
- GPT-4 then filled in the identified template sections using the provided source documents, and all outputs were reviewed by AI engineers and SMEs to improve performance (**Figure 2**).
- 'One-shot' or 'few-shot' (depending on the complexity of the section) examples of pre-submission form answers were utilised to guide the model's style and information retrieval from the source documents, facilitating retrieval-augmented generation (RAG).

Figure 2. Overall CDA pre-submission template generation architecture

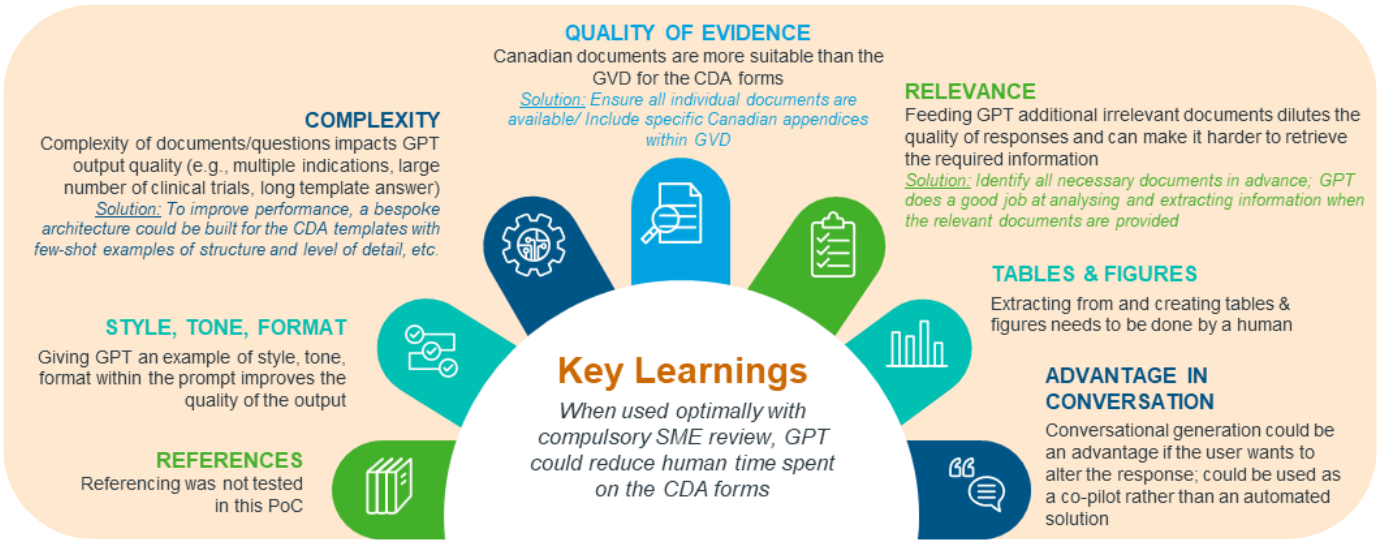


***Text vector embeddings** are generated by a neural network that is trained to create similar vectors for sentences with similar meaning*

RESULTS

- When provided with the most relevant Canada-specific documentation and 'few-shot' examples of required outputs, GPT-4 produced high-quality drafts of CDA pre-submission forms.
- Section answers were generated accurately in terms of correct information, accepted tone, and aligned format.
- Complexity of source documents and pre-submission form sections were found to impact output quality and feeding GPT-4 irrelevant documents diluted the quality of responses, amongst other key learnings (**Figure 3**).

Figure 3. Key learnings from the PoC



CONCLUSIONS

- **When used optimally and with compulsory SME review, GenAI can be used to create acceptable first drafts of CDA reimbursement dossier forms.**
- **There is high potential that use of GenAI will reduce human time spent on submissions.**
- **However, it is essential that documentation required for the forms is optimised with the most relevant data in advance of use by GenAI.**
- **Improving prompting and increasing 'few-shot' examples for more complex sections of the forms will further help to improve time savings.**

Abbreviations: CADTH: Canadian Agency for Drugs and Technologies in Health; CDA: Canada's Drug Agency; GenAI: Generative Artificial Intelligence; GPT: Generative Pre-Trained Transformer; GVD: Global Value Dossier; HTA: Health Technology Assessment; LLM: Large Language Model; PoC: Proof-of-concept; RAG: Retrieval Augmented Generation; SME: Subject Matter Expert.

References: **1**. CADTH (2023). Pre-submission Meeting Request Form. Available at: https://www.cadth.ca/sites/default/files/Drug_Review_Process/CADTH_Pre-Submission_Meeting_Request_Form.docx (Accessed November 2023); **2**. CADTH (2023). Pre-submission Meeting Briefing Paper. Available at: https://www.cadth.ca/sites/default/files/Drug_Review_Process/CADTH_Pre-submission_Meeting_Briefing.docx (Accessed November 2023); **3**. CADTH (2023). Advance Notification Form. Available at: https://www.cadth.ca/sites/default/files/Drug_Review_Process/CADTH_Advance_Notification_Form.docx (Accessed November 2023).

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