

Enhancing Declarative Business Process Management Availability Through Generative AI Extended Abstract – CTDG-SI 2026

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Abstract. *This work addresses the scarcity of multi-perspective declarative process models caused by privacy constraints and formalism adoption by introducing Terpsichora, a framework utilizing Large Language Models (LLM) for synthetic generation. Aligned with the “Grand Challenges of Information Systems Research in Brazil” (GranDSI-BR) 2016-2026, it bridges openness and privacy through synthetic artifacts for public benchmarking, tackles multi-perspective modeling across diverse domains, and evaluates cognitive comprehensibility. Validated through Representation Theory, the 2,000 produced models confirm syntactic rigor, semantic accuracy, and pragmatic validity.*

1. Introduction

While imperative process modeling dictates strict execution paths, declarative frameworks such as Declare define allowed behavior through constraints, offering adaptability for organizations [van Der Aalst et al. 2009]. MP-Declare extends this paradigm by capturing interdependencies among activities, data, resources, and temporal conditions [Burattin et al. 2016]. However, organizations rarely disclose process artifacts due to privacy concerns [Feuerriegel et al. 2024], and while repositories exist for imperative models [Corradini et al. 2019], equivalent archives for declarative frameworks are virtually non-existent [Alman et al. 2023].

This article presents contributions originally published as [Santos et al. 2025, da Silva Santos et al. 2025], introducing *Terpsichora*, a framework leveraging LLMs to generate synthetic MP-Declare models. The research aligns with GranDSI-BR [Boscarioli et al. 2017] on three fronts: (i) *Information Systems and the Open World*, bridging open science and confidentiality; (ii) *Complexity of Information Systems*, promoting multi-perspective modeling; and (iii) *Sociotechnical View of Information Systems*, evaluating artifact quality through Representation Theory [Weber and Lybrand 1997].

2. Terpsichora: Framework and Methodology

Terpsichora comprises four modules: a *Metamodel Implementation* layer (Pydantic) enforcing structural integrity; a *Generation Orchestration* module managing Function Calling (FC) and Structured Output (SO); a *Domain Integration* module translating natural language into process artifacts; and a *Validation* module via Declare4Py. The prompt engineering strategy combines role-play prompting [Shanahan et al. 2023], knowledge injection [Martino et al. 2023], and few-shot learning [Brown et al. 2020]. We assessed two LLMs (GPT-4o and Gemini 2.0 Flash) with FC and SO techniques. Evaluation employed complexity metrics [Abbad-Andaloussi et al. 2023] for syntactic and pragmatic analysis and 7PMG labeling conventions [Leopold et al. 2013] for semantic quality. A total of 2,000 models were generated across 500 business domains¹.

3. Results and Discussion Aligned with GrandSI-BR

Information Systems and the Open World. Terpsichora directly addresses the GrandSI-BR tension between openness and privacy. By generating synthetic artifacts preserving statistical and behavioral properties of real processes, it bridges open science and organizational confidentiality. The comparative analysis reveals that successful implementation relies on balanced feedback loops and validation rather than a single technique. Both LLMs maintained consistent syntactic density and semantic coherence, enabling public benchmarking without exposing proprietary data and directly confronting the scarcity constraining declarative process research.

Complexity of Information Systems. The prompt engineering strategy addresses the inherent complexity of multi-perspective declarative modeling by guiding LLMs to internalize constraints through role-play, knowledge injection, and few-shot learning. FC exhibits structural consistency with lower standard deviations, while SO demonstrates superior capacity for semantic complexity, particularly activation and correlation conditions. Label compliance rates exceeding 98% confirm that automated generation preserves domain specificity and formal properties at scale.

Sociotechnical View of Information Systems. Pragmatic evaluation through density and separability metrics assesses how analysts comprehend generated models. SO produces higher density and interconnectedness, elevating cognitive load, whereas FC favors separability, enabling mental decomposition into manageable chunks [Abbad-Andaloussi et al. 2023]. Both methods generated constraint variability ranging from simple to cognitively demanding, validating Terpsichora as a tool serving both algorithmic training and human analysis needs.

4. Conclusion

Terpsichora synergizes prompt engineering with automated validation, yielding 2,000 MP-Declare models with stable density and high labeling compliance. Aligned with GrandSI-BR, it resolves data scarcity from privacy constraints, addresses multi-perspective complexity, and ensures sociotechnical adequacy. Future work will expand to other formalisms such as DCR Graphs and explore hybrid modelling approaches.

¹Models and generation pipeline publicly available at: <https://github.com/santos-wesley/Terpsichora>

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