

# Opponent's review of candidate TRIZ Master thesis “TRIZ: Generative AI Application” by Tanasak Pheunghua

## Relevance of the candidate's work

This work focuses on the systematic development of prompts presented to Generative AI applications to acquire responses supporting effective problem-solving. In order to follow TRIZ methodology throughout this process, the Author proposed a 10-step algorithm to create structured prompts for specific TRIZ tools.

## Objective of the work

The objective is: *"Develop a systematic algorithm to integrate Generative AI capabilities, particularly Large Language Models (LLMs), with TRIZ tools, enabling a consistent and effective application of AI to enhance problem-solving and innovation processes"*.

## Scientific significance of obtained results

Taking the objective literally, we should consider the algorithm the project result, perceiving the prompts as evidence of testing the algorithm for several TRIZ tools. Following this perspective, the significance of the result comes from the possibility that other people use the algorithm to approach the same or other TRIZ tools so that LLMs could generate the responses as if a professional applied the respective tools.

## Practical value of the results

The benefits described in the thesis are mainly related to the application of developed prompts in training and problem-solving contexts, which suggests that the prompts (not the algorithm) are the project result. The feedback from the user survey was mostly positive, but 10 of 20 inquired users reported logical inconsistencies in the responses. The only direct comparison proved that the other tool could generate better results.

## Implementation of the main provisions of the work

The algorithm is presented by describing activities required in particular stages to develop, debug and apply tool-specific prompts, accompanied by recommendations, guidelines and literature references. Such a formula suggests that a potential algorithm user should be proficient in TRIZ and prompt engineering. Despite calling this algorithm, some operations (e.g., the prompt refinement) seem heuristic rather than algorithmic.

## Novelty of the results

I am unaware of other attempts at rule-based development of structured AI prompts for specific TRIZ tools, which adds to the novelty of the approach. Nevertheless, similar or better responses may be obtained without structured prompts since LLMs can apply TRIZ tools out of the box, making the relevance of the whole work disputable.

## Structure of the thesis

The structure generally follows the recommendations provided on the MATRIZ Official website, with the analysis of the results surprisingly addressed twice. Out of 14 literature references, 10 relate to AI and prompt engineering, and two address problem-solving using AI. One is a self-citation on structured prompts, and one refers to the application of AI with TRIZ. Such a distribution seems unusual for a TRIZ-related certification work.

## Disadvantages of the work

The thesis suffers from several deficiencies of different types:

- the statement of the problem to be solved is not clear,
- the content of the thesis does not match the declared objective,
- calling fine-tuning of LLMs with prompts "integration" is incorrect and misleading,
- example descriptions suggest that interaction is considered equivalent to function,
- approach to cause-effect analysis does not reflect the CECA nor RCA+ method,
- sample prompt refinement (7.1) is presented without showing the AI responses,
- hallucination problem is handled by asking the user for more detailed information,
- the advantages of using structured prompts over free-form queries are not clear.

## Characteristics of the work presented

Declared benefits and survey scope indicate that the collection of prompts is an actual project outcome, which contradicts the stated objective. Together with the selection of literature sources, this indicates that prompt engineering is the actual subject of this thesis, while TRIZ appears as the application area.

The repeated recommendations of expert verification of AI responses for accuracy and feasibility (7.2) suggest that the main benefits of structured prompts are directed information retrieval and wizard-style navigation support. The Author also underscores that the quality of the results depends heavily on input from the user. On the other hand, the prompts allow for extending the native functionality of the specific tools, like adding investigation guidelines to cause-effect analysis.

## Conclusion whether the candidate can receive the title of TRIZ Master

Despite some attempts to demonstrate the ability of AI models to support the creation of new tools, this work does not seem to extend TRIZ methodology. It also does not describe successful TRIZ-based projects or novel TRIZ training approaches. Therefore, it does not fit the existing certification categories (researcher, practitioner, teacher).

In conclusion, due to the unusual scope and indicated drawbacks, I find it inappropriate to defend this thesis as a TRIZ Master dissertation within the current TMCC regulations framework. Nevertheless, it seems advisable to reconsider the objective and problem statement, reorganize the thesis, and resubmit it as a TRIZ Master Teacher dissertation. Besides, TMCC might like to consider adding new certification categories and requirements to address the ever-increasing interactions between TRIZ and AI.

