# Scientific Advisor’s Review

## 1. Introduction

The thesis entitled "TRIZ: Generative AI Application" by Tanasak Pheunghua examines how Generative Artificial Intelligence (AI) can help in the application of TRIZ methods. This review attempts to examine the thesis in terms of the methods used, the results and the contribution to TRIZ with a particular focus on the novelty of the work produced.

## 2. Summary of the thesis

The thesis deals with improving the innovation process and the methods of TRIZ with the integration of Generative AI. The so-called Large Language Models (LLMs) are primarily used for this purpose. They are intended to simplify the application of TRIZ for the learning process, simplify problem solving, extend TRIZ to other areas of application and promote the development of new TRIZ tools. The research work includes a ten-step algorithm for the integration of AI with TRIZ tools, in which the procedure is described: From identifying the integration task to be solved, to developing specific TRIZ prompts, to conducting the case studies to demonstrate the beneficial approach in practical application.

## 3. Evaluation of the methodology

The detailed algorithm for the integration of AI in TRIZ includes the following steps: Identifying the TRIZ tool and the goal to be pursued, explaining the TRIZ tool to AI, specifying the classical TRIZ tools, selecting and creating relevant prompt elements, applying prompting techniques, defining the user expectations for the application, determining the necessary user input, designing the prompt, experimenting with different prompt sequences and testing the process with different problems. This step-by-step approach ensures that the application of generative AI is effective and precisely tailored to the user's needs.

## 4. Critical analysis of the results

The thesis shows that there are advantages to combining generative AI approaches with TRIZ. The user learns how to use the TRIZ tools better, speeds up the solution of problems and can develop new tools based on this. The various case studies show that the theoretical approach also proves itself in practice. Within the thesis, only a few case studies by Tanasak Pheunghua were used. However, it is known from his other works that he has repeatedly demonstrated the effectiveness and applicability.
The thesis points out potential problems, which I would also like to address here: the use of LLMs to solve problems could lead to users relying more and more on AI instead of developing their own creative thinking skills. In addition, the output of the AI must always be checked for correctness by the relevant experts.

# 5. Discussion of the most important aspects

The most important aspects of the thesis that should be discussed in the defense are the effectiveness of the proposed algorithm, the impact of AI on learning TRIZ, and the application of AI to real-world problems. The thesis emphasizes that there are significant improvements in the accessibility and efficiency of TRIZ learning. Furthermore, the potential of AI in conjunction with TRIZ becomes apparent through the case studies and the surveys.

# 6. Personal contributions to the field

Tanasak Pheunghua is one of the pioneers of AI integration in TRIZ. He has made many contributions in this field. The download numbers of the main work "TRIZ and Generative AI-V3.0" on Researchgate alone (3609 reads, as of 5.8.2024) are fantastic for a TRIZ paper. He has pioneered research into the development of algorithms that enable AI-supported TRIZ working with the help of prompts. He willingly provides his insights and recommendations for future work, creating a foundation for much further work in this area.

# 7. Implementation and practical application

The research findings have been implemented through the development and refinement of prompts and the application of prompting techniques. The practical application of the integrated approach is evidenced by case studies and supported by feedback surveys.

# 8. Conclusion and recommendations

Overall, the thesis presents a comprehensive and very well-structured approach on how generative AI can be combined with TRIZ. The results of the thesis show the significant advantages that arise from this combination, but also point to possible challenges in the future. The work thus represents a milestone that can improve innovation and problem solving in a wide variety of areas. It therefore has a significant impact on the TRIZ community.

To summarize, Tanasak Pheunghua's thesis makes an outstanding and extremely valuable contribution to the field. His work lays a foundation for future research and development in the field of AI and TRIZ integration.

For these reasons, I strongly recommend that Tanasak Pheunghua be awarded the title of TRIZ Master.