

INNOVATIVE CASES OF TRIZ APPLICATION IN AUTOMOTIVE INDUSTRY

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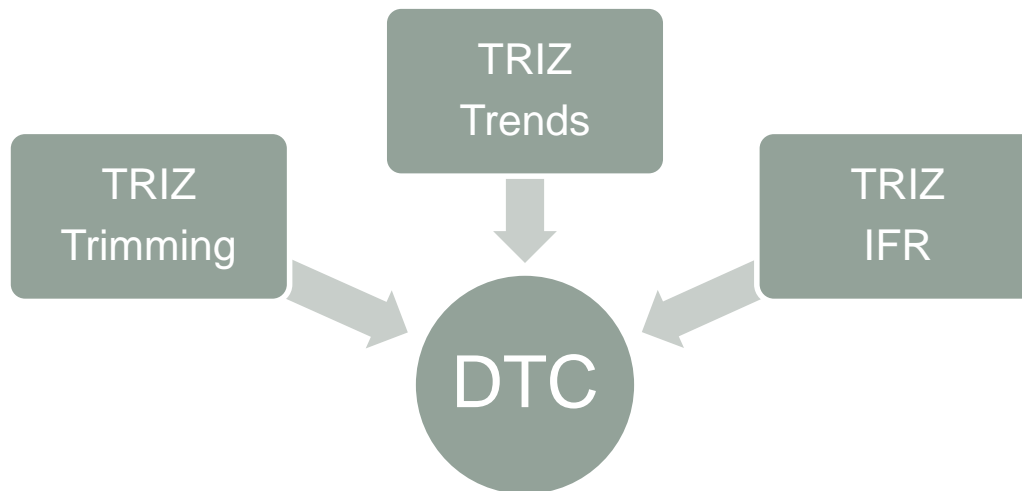
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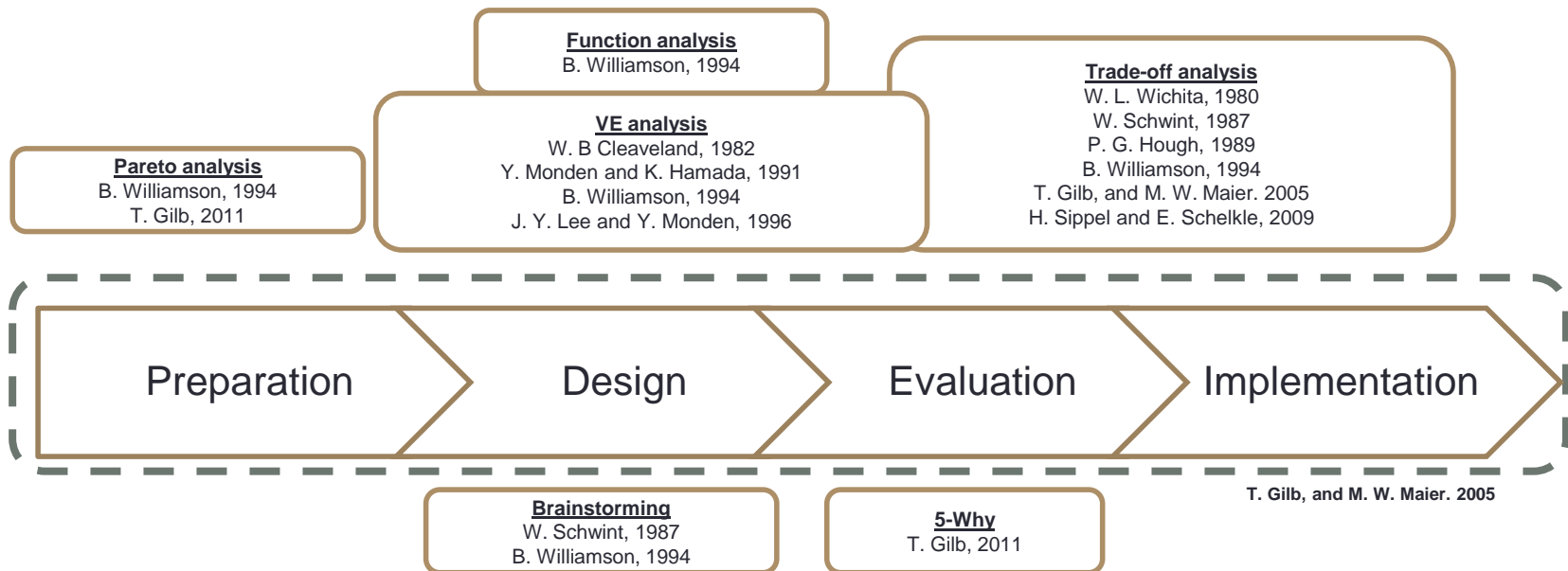
1. Introduction

- In this competitive environment, product cost which directly affects product pricing, have become a critical criteria for the customer to choose and purchase a product. It has become a great challenge for manufacturer to meet those demand while maintaining lowest product cost but still meet the customer satisfaction level.
- A study was done, exploring the Design To Cost (DTC) strategy to manage those challenges, focusing on the design to achieve cost reduction in product cost by integrating TRIZ methodology.



2. Why DTC strategy?

- Previous research quoted that DTC consists of 4 general phases. Within those phases, there are common tools and methods use to achieved target cost, typically set by the management.

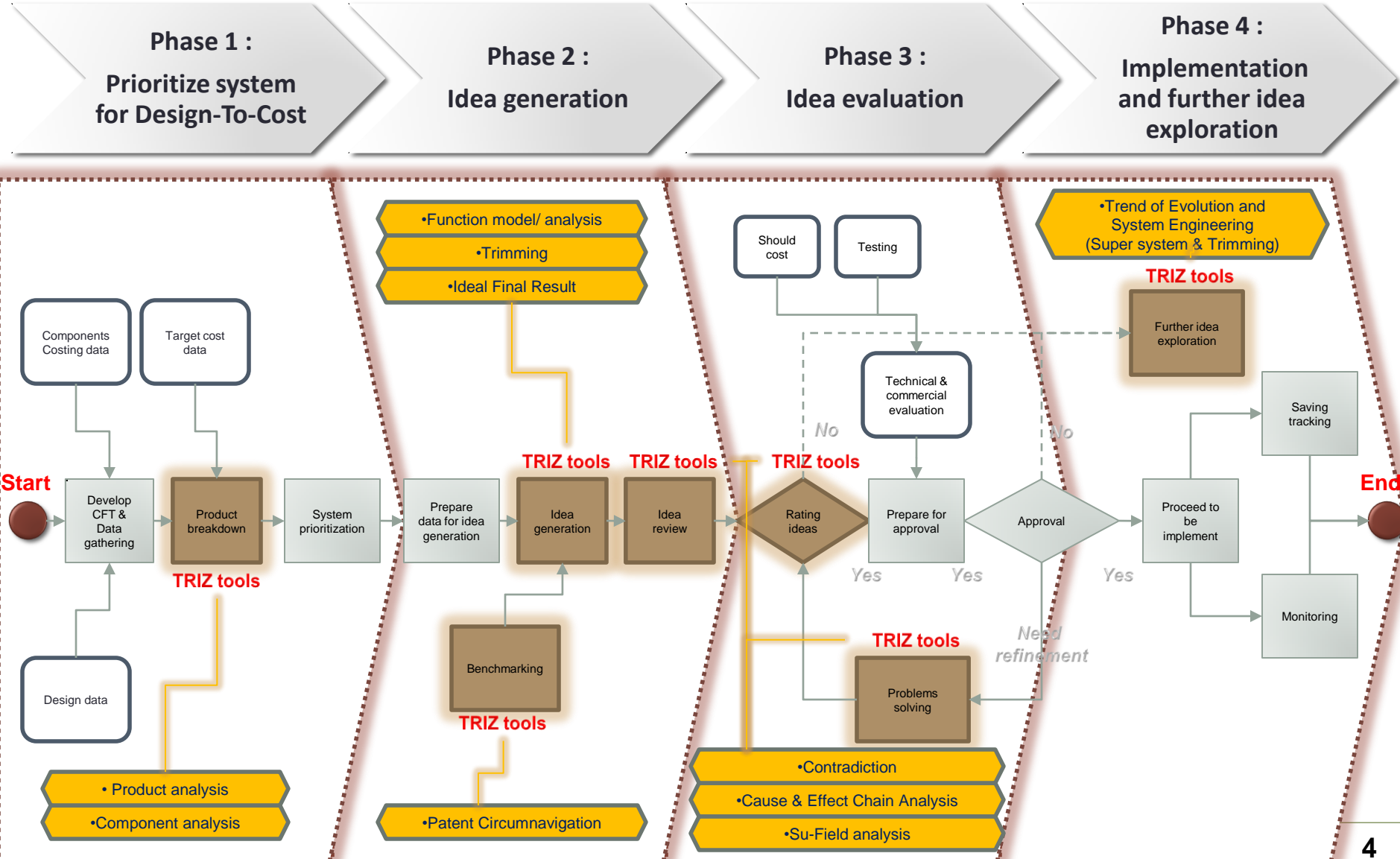


- However, conventional DTC always used trade-off in order to achieved result. This provide opportunity for TRIZ to enhance DTC without depending on trade-off.

3. Developing DTCI framework

- Based from the literature and input from experts, a framework is developed called 'Design To Cost Innovation' (DTCI). It integrates the most common TRIZ tools that enhance each phase in conventional DTC strategy.
- The integration depends on the deliverables of each DTC phase.
 - The first phase is prioritization of system and the tools suitable for this activity is the product or component analysis.
 - The second phase is idea generation. Here, TRIZ tools such as Function analysis, Trimming, IFR and Patent benchmarking were proposed.
 - The third phase will be the evaluation process, which normally related to idea refinement using problem solving techniques in TRIZ.
 - The final phase focuses on filtering the feasibility of DTC ideas generated.

4. Proposed DTCI framework



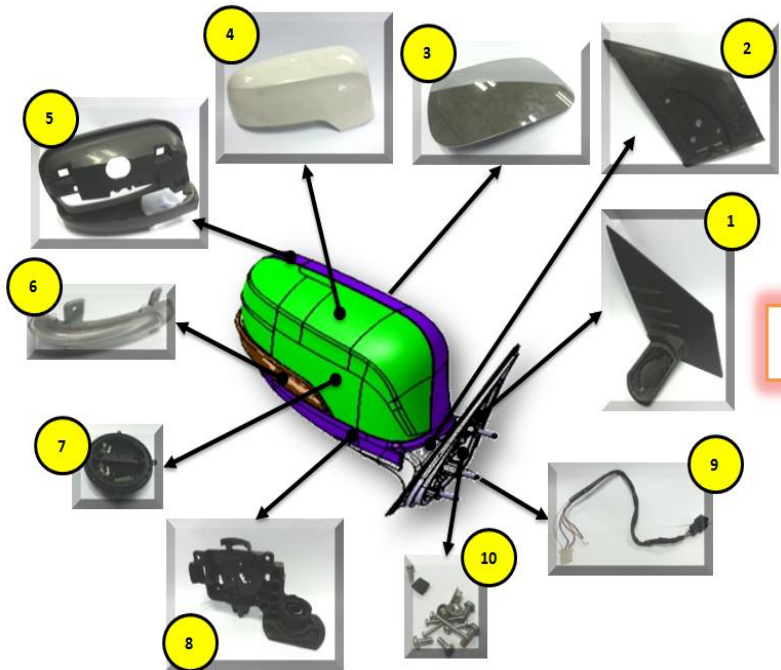
5. Case study in automotive industry

- An automotive OEM is selected where several case studies are developed by adopting the proposed framework. The company is selected because of their capability in conducting a full cycle product design process.
- There are 14 case studies developed utilizing the proposed framework, and involving both the OEM itself and several suppliers.
- The duration of each case study is around 1 to 3 months to be completed at the conceptual level and it takes further 6 to 12 months to actually implement the concept into the product for market.
- The cost improvement results are captured after the case implementation is completed.

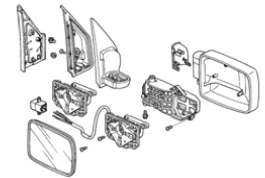
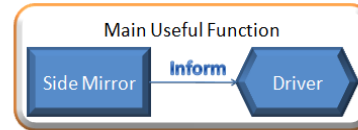
6. Case study #1: Side Mirror system

- One of the TRIZ Implementation team is taking side mirror system as part of the project utilizing the DTCl framework.

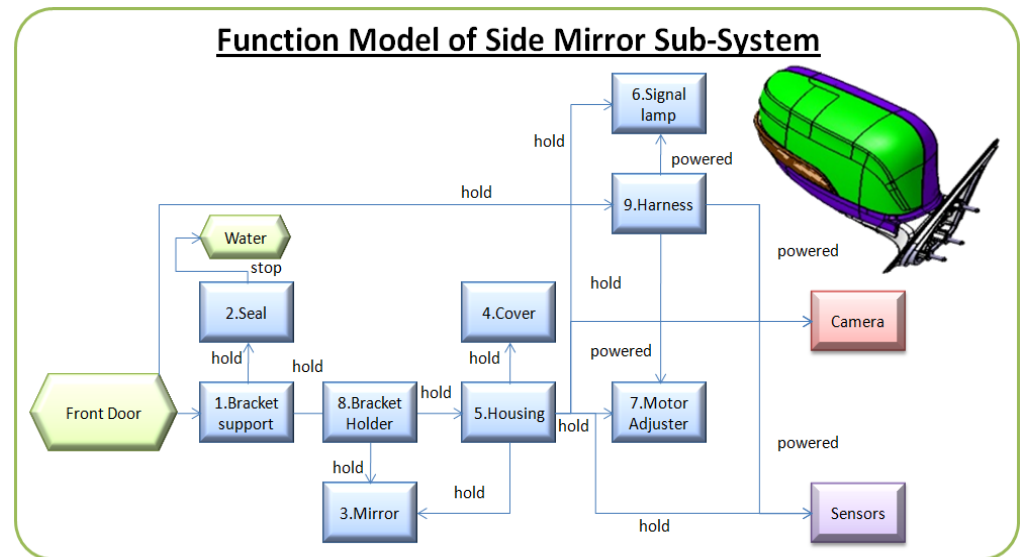
Total of 10 components in the current side mirror system



Function Model of Side Mirror System

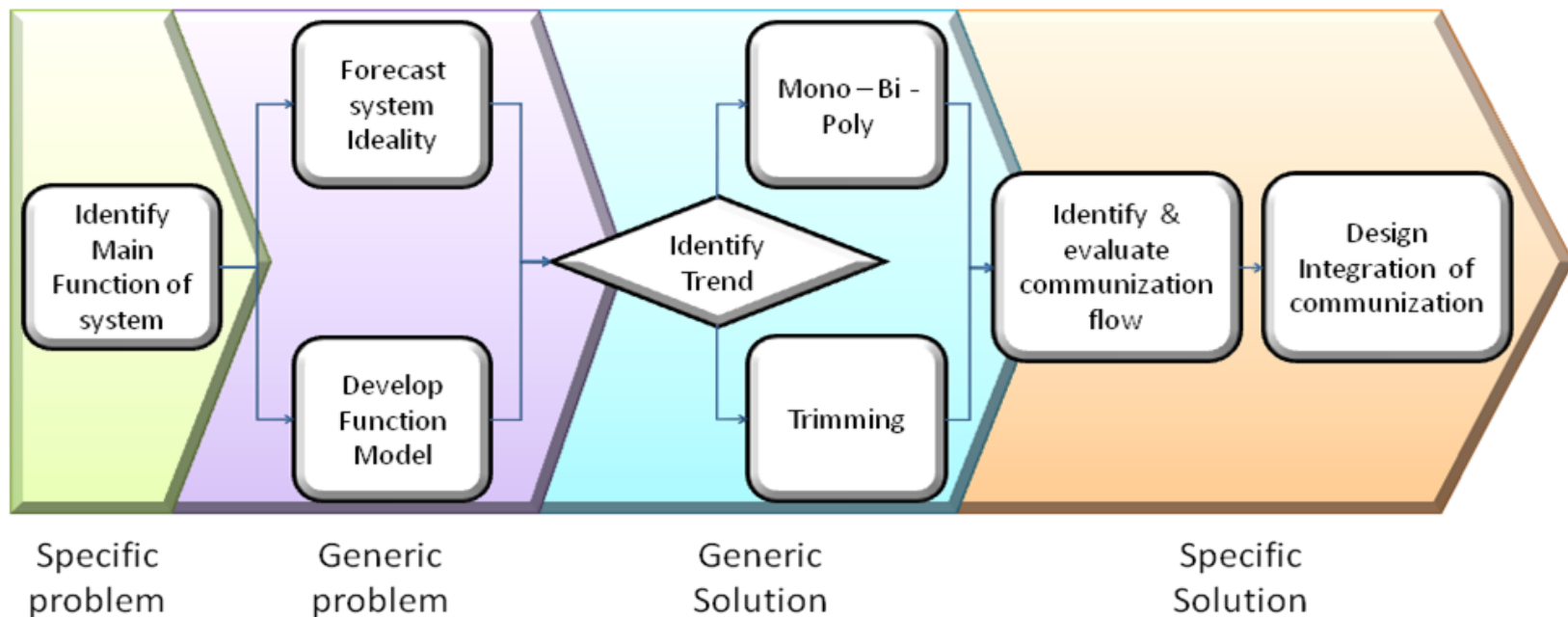


Function Model of Side Mirror Sub-System



7. Case study #1: Side Mirror system

- The process of reducing complexity and communization using TRIZ are mentioned as follows:

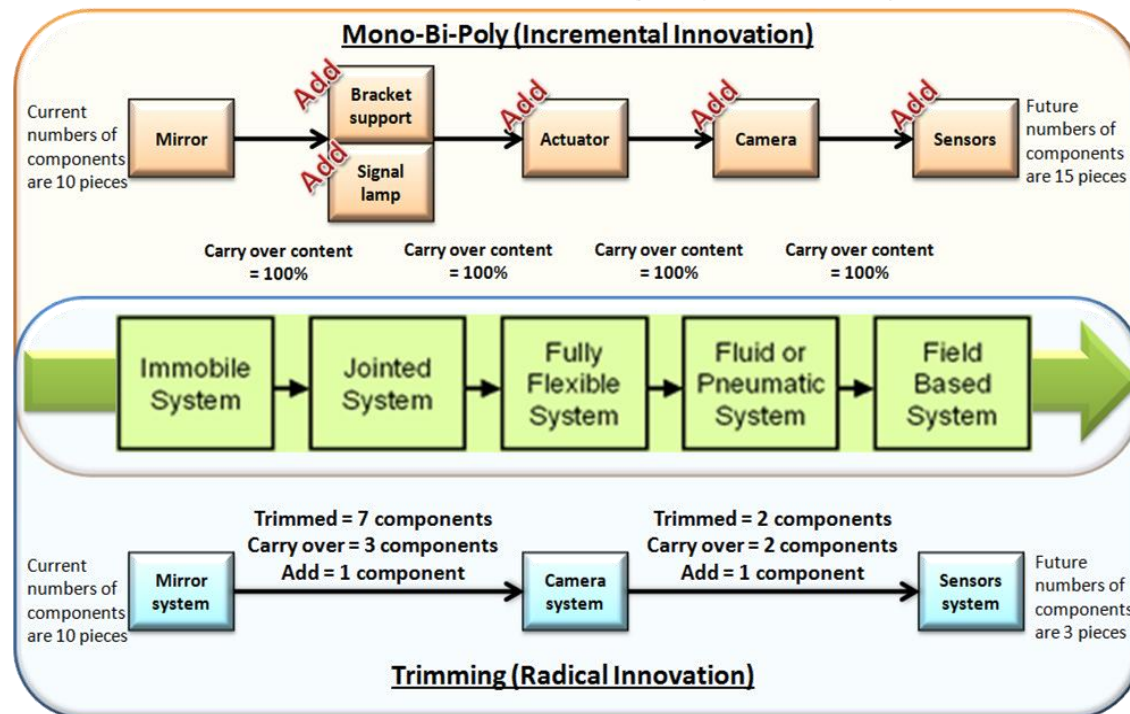


- There are 2 type of TRIZ approaches in this project, simplify the system using Trimming or increase the trend towards Super-system through Mono-bi-poly.

8. Case study #1: Side Mirror system

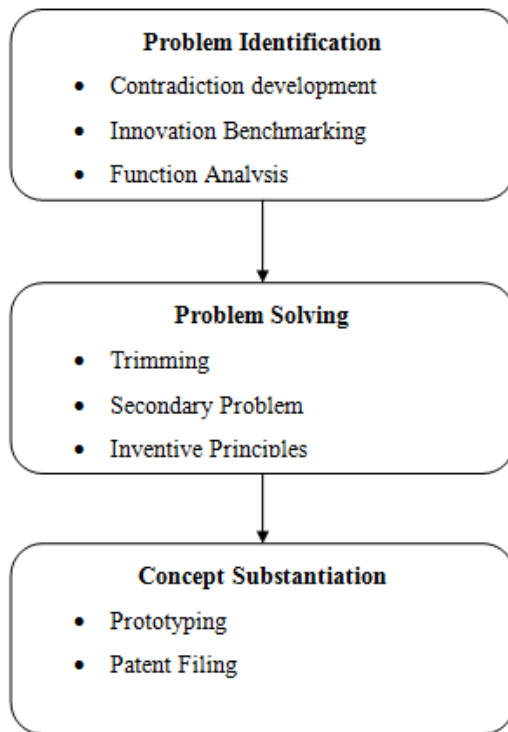
- The results show positive impact on cost reduction in term of simplification or communization. However, which option to take will be decided by the top management to pursue based on the business case.

Product Complexity Planning using Trend of increasing Dynamicity



9. Case study #2: Cost reduction with Patent Circumvention

- As all know patent brings new level of competitiveness, especially in automotive industry. Innovative Benchmarking may open up new possibility to create another innovation. This can be achieved using Patent Circumvention.



- However, in the real situation things maybe more difficult when cost reduction is also a part of the target, which is normally people compromise for the long term goal.
- DTCI is used to explore this situation and to demonstrate how the results are achieved, and later comparison is made to the normal patent development process.

10. Case study #2: Cost reduction with Patent Circumvention

- Another team that specialized in automotive Powertrain and Transmission is exploring the patent on cylinder deactivation system.

Bentley V8



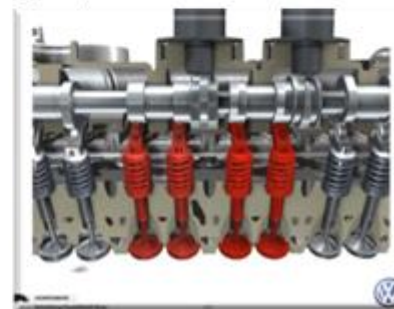
A1 Sportback - Cylinder-on-demand



Bosch Cylinder Deactivation



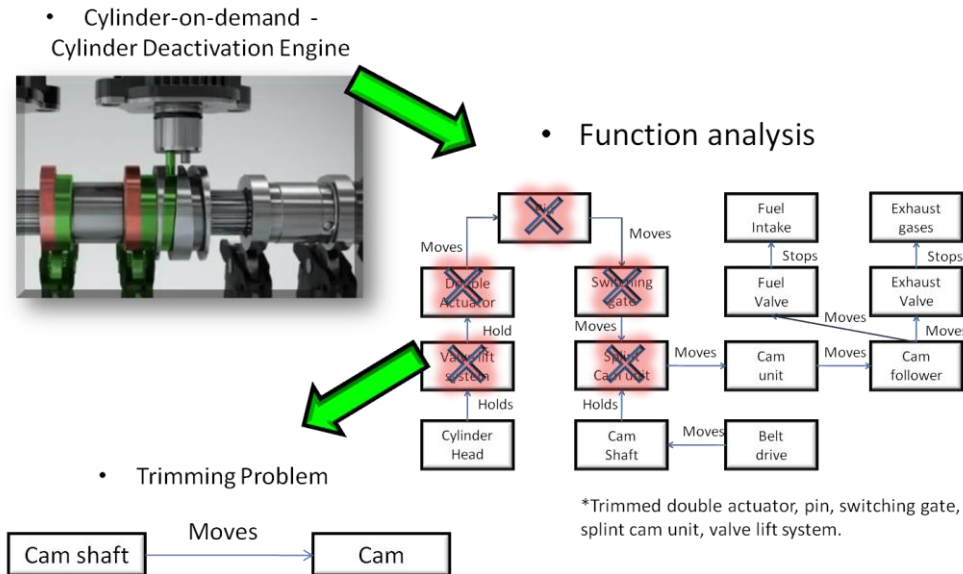
Volkswagen cylinder deactivation technology



- The team benchmarked 4 types on patent related to cylinder deactivation system.

11. Case study #2: Cost reduction with Patent Circumvention

- The activity really requires strong teamwork between the group of designers and the group from legal unit, from the very beginning of the project.

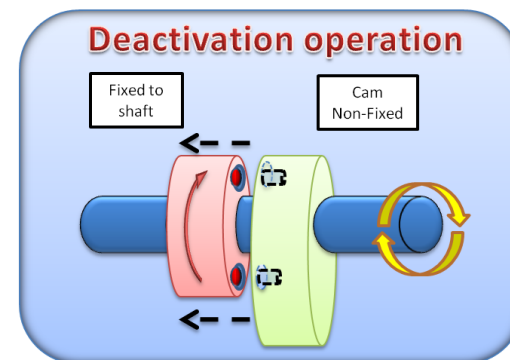
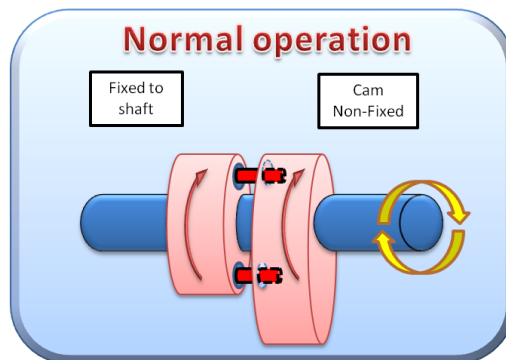
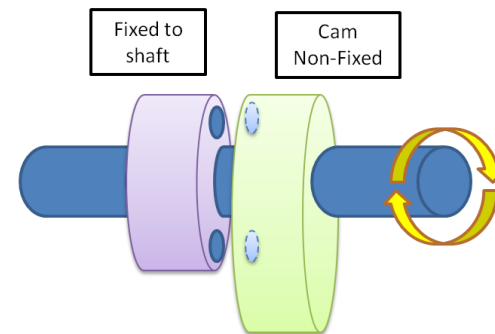


- For the mechanism of the selected system, patent circumvention process used trim out and for secondary problem is solved using Technical Contradiction.

12. Case study #2: Cost reduction with Patent Circumvention

- Using the feasible concept generated, new system of cylinder deactivation is created. However, the concept need to be refine further in term of technical ground and also legal perspective.

- Solenoid valve to control oil pressure
- Oil Pressure sensor increase to 4 bar
- Oil gallery pushed the pin to deactivate the Non fixed cam.
- Using similar system based by Lotus (CPS engine principle)

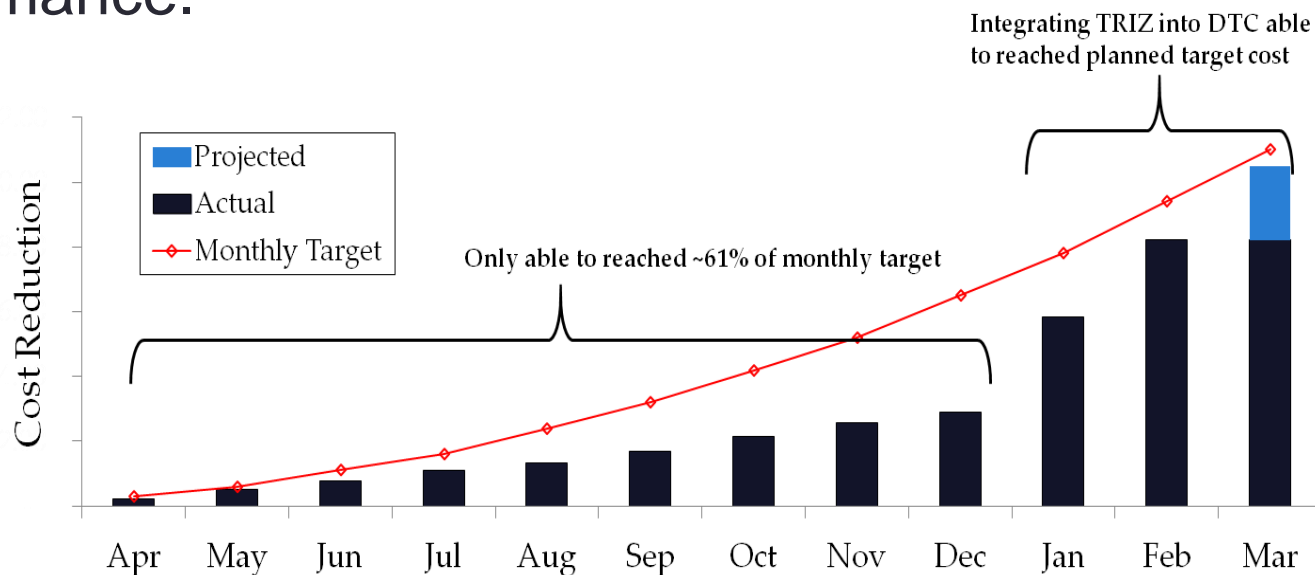


13. Other case studies in different area

- The DTCl framework does not stop on the mentioned cases, it is also applied in different projects as follows;
 - Automotive car styling
 - Problem related to manufacturing and assembly.
 - Non technical project such as service of after sales.
 - Cooling management for engine room.
 - Utility features for automotive interior
 - Improving THACHEM (car security system)
 - Hybrid and EV project
 - Material Planning for steel (stamping) and non-steel
 - Vehicle architecture and integration
- All projects are require to contribute to cost improvement at certain level and at the same time increase the level of innovation in the existing condition.

14. Cost reduction result

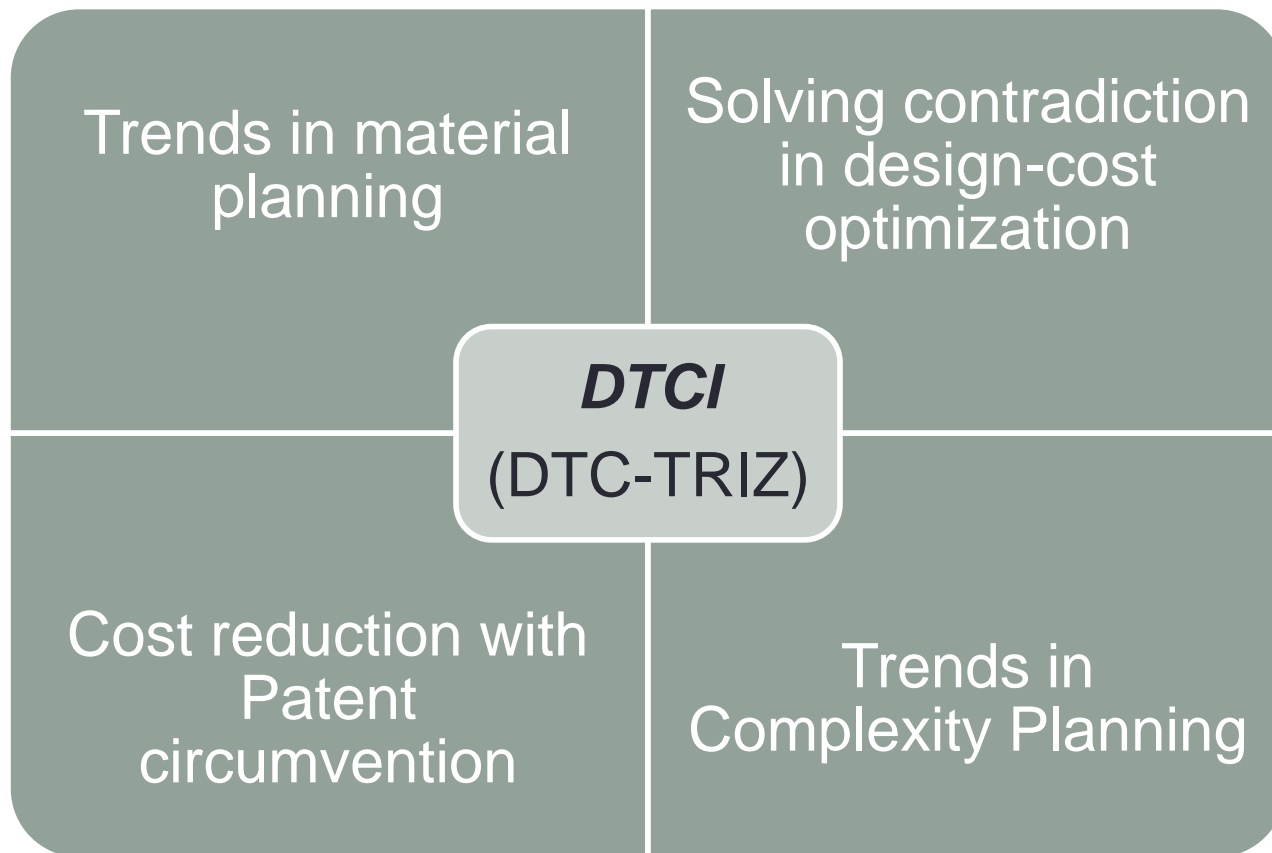
- In the same financial year (2011/2012), the organization really shows significant results in cost reduction performance.



- Those initiatives continue, adopting the proposed framework and eventually achieved further cost reduction in the following financial year.

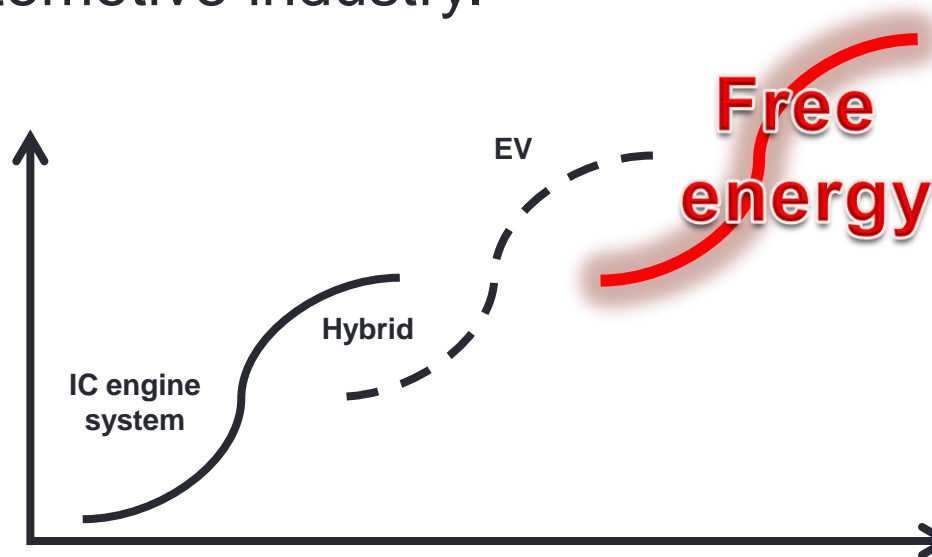
15. The contribution of DTCI framework

- There are several critical new knowledge types established, from adopting the DTCI framework.



16. What is next for TRIZ in DTCI?

- The more you know about something, the more you still don't know about. Hence, DTCI is used in starting and forecasting future products and technology, beyond the trends of automotive industry.



- The organization is creating research teams to look into the new S-Curve, and it definitely used TRIZ as a part of the mechanism towards future product innovation.

17. Conclusion

- The proposed framework is applied successfully in the automotive OEM, who has the responsibility throughout the lifecycle of the product.
- TRIZ able to enhance the outcome in cost reduction and increase the level of innovation in product, process and service.
- However, there is still room for improvement to the proposed framework, to process innovation and breaking the psychological inertia in the organization and its suppliers.
- This framework can be applied in any industry that have similar type of organization and nature of business.

***THANK YOU VERY MUCH
FOR YOUR ATTENTION***



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