

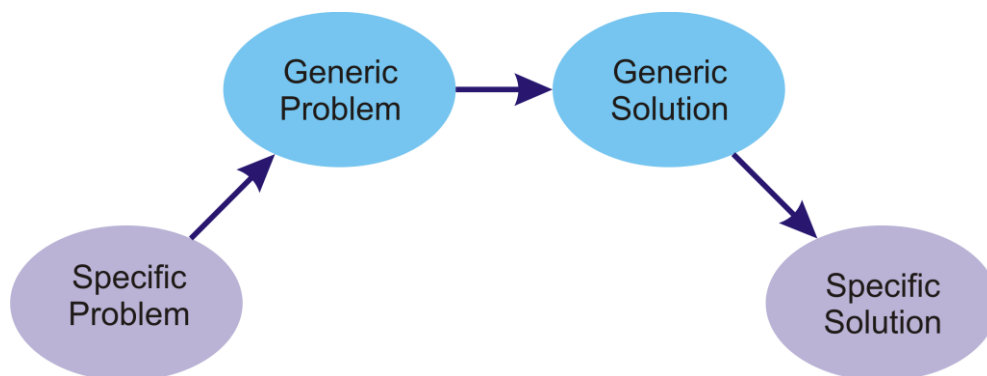
TRIZ, Theory of Constraints and Lean

Introduction

TRIZ can be thought of as a way of accessing existing excellence in problem solving. That is to say, TRIZ is not based upon completely novel ways of solving problems, but instead it works by taking existing methods and techniques – even though they may have been originally applied in other application areas, and making them accessible and useable to all problem solvers – no matter what domain or discipline they may be working in.

Thus, for example, the TRIZ Inventive Principles are in one sense the World's Inventive Principles and the TRIZ Standard Solutions the World's Standard Solutions and so on.

The power and utility of TRIZ comes from the ways in which it enables its users to first uncover the underlying generic problem that lies behind the specific problem they are setting out to solve, second to provide a generic solution to that generic problem, and finally to enable the generic solutions to be interpreted in terms of the original specific problem. This pattern is called the Prism of TRIZ:



A key characteristic of TRIZ solutions is that they are derived from observation of the way problems have been solved successfully. Or, to put it another way, TRIZ is a systematic way of accessing and applying the World's best practice for problem solving.

If this is the case, then when we look at any successful problem solving method we should expect to find that it aligns with one or more of the TRIZ thinking tools.

TRIZ and the Theory of Constraints

Theory of Constraints (ToC) is a successful methodology that is used for solving problems associated with process-based systems: typically, but not necessarily, manufacturing systems.

One useful principle within ToC is the notion of an underlying imperative or goal that should be pursued. This goal has two uses: it provides a strategic

direction in which all efforts should be directed and it is also a valuable thinking tool in its own right.

The ToC goal, can be paraphrased thus:

Increase Throughput and Reduce Inventory (or Investment) and Reduce Operating Costs

Note the emphasis on the 'ands' – it is not sufficient to achieve just part of the formula – all three elements must be tackled.

If we turn to TRIZ, we find something similar. The TRIZ goal is to increase 'Ideality', which can be expressed in terms of this simple formula:

$$\text{ideality} = \frac{\text{benefits}}{\text{costs} + \text{harms}}$$

That is, when using TRIZ we seek to:

Increase Benefits and Reduce Harms and Reduce Costs

(Note: In the TRIZ context, 'Harm' is any system output that is not a benefit and 'Cost' refers to any and all inputs to the system)

There is an obvious parallel between the ToC and TRIZ goals:

- ToC 'Throughput' is a special case of the TRIZ 'Benefit'
- ToC 'Inventory' is a special case of the TRIZ 'Harm'
- ToC 'Operating Costs' is a special case of the TRIZ 'Cost'

Another TOC thinking process is the 'Evaporating Cloud' or 'Conflict Resolution Diagram' which (as the name suggests) is used for conflict resolution. This process used to both identify the conflict that lies behind a problem as well as providing a method for its resolution.

Here too, TRIZ has an analogous general problem solving method: the notion of Ideal Outcome, Ideal System and Contradictions. The Ideal Outcome and Ideal System tools are used (amongst other things) to help identify conflicts (referred to as 'Contradictions' in TRIZ terminology) and then a variety of TRIZ methods are then used to resolve the contradictions (such as Inventive Principles and Separation Principles).

While ToC has undoubted value in dealing with certain classes of problem in the manufacturing or process domain, TRIZ can operate more widely over a greater range of problem types.

A similar approach can be taken when considering methods such as Lean or the Toyota Production System (TPS).

TRIZ and Lean/TPS

Both TPS and Lean place emphasis on the ruthless elimination of waste in all its forms in order to optimise flow in a process system. Different classes of waste are identified and techniques, such as value stream analysis are used to help identify where and when waste occurs.

In TRIZ terminology waste will manifest itself as Excessive Benefit, Harm or Cost – and TRIZ provides a range of methods for dealing with these types of problems (such as Standard Solutions and Trimming). Furthermore, the wide range of TRIZ problem solving tools are of value when implementing solutions to problems highlighted by Lean thinking.

Conclusion

When considering some of the relative merits of ToC, Lean and TRIZ we are not dealing with a simple case of 'methodology A is superior to methodology B'. The right approach is more subtle than that. The underling philosophy of TRIZ is to re-use and exploit existing excellence in problem solving. With this in mind it would be sensible to combine the various methods, using the more specialist tools within ToC and Lean when dealing with problems suited to them – augmented and supported by TRIZ to help implement solutions to the problems that they highlight. On top of this, TRIZ should also be used more widely to directly tackle any problem that lies outside the scope of ToC or Lean.

While both ToC and Lean are useful and effective in creating, sustaining and developing process-oriented systems (such as manufacturing), combining them with TRIZ methods of systematic problem solving takes these tools to a new level. It also offers the additional benefits of a universally applicable problem solving system that can be applied across every aspect of any organisation or enterprise.

Andrew Martin
19 September 2010