

Part One
TRIZ Logic and the Tools for Innovation
and Clarity of Thought

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TRIZ Tools for Creativity and Clever Solutions

What is TRIZ?

TRIZ is a unique, rigorous and powerful toolkit which guides engineers to understand and solve their problems by accessing the immense treasure of past engineering and scientific knowledge. TRIZ helps us find the surprisingly few relevant and practical answers to our real problems. This is made simple by the TRIZ summary of all the conceptual answers to engineering and scientific problems.

TRIZ is the only solution toolkit which exists so far in the world that offers engineers help beyond brainstorming at the actual *concept–solution locating* and *problem solving* moments. There are wonderful toolkits for understanding problems, with analysis processes for capturing the requirements, analysing the systems, looking at processes and pinpointing actual causes of problems. There are also many rigorous and useful toolkits for the time after problem solving has occurred, including processes for selecting solutions and developing them, with useful ways of evaluating and predicting costs etc.; but for the actual moment of problem solving – the search and capture of the right solutions or new concepts – there is only TRIZ. Until TRIZ the assumption has been that clever engineers and scientists would somehow find the right answers either individually or collectively by brainstorming and using their experience and knowledge.

DURING – Problem Solving		
Brainwave ideas		
Brainstorming		
Creativity Tools		
and/or		
TRIZ		
BEFORE – Preparation for Problem Solving	TRIZ Conceptual Solutions	AFTER – Solution Selection and Development
TRIZ and other tool-kits for Requirements / needs capture	40 Principles	TRIZ and other Tool-kits for
System analysis	76 Standard Solutions	Concept development
Find any root causes of problems etc.	8 Trends	Concept selection process (such as Pugh Matrix)
	all used with relevant World’s Knowledge and TRIZ Creativity Tools including – Ideal Solutions	Successful innovation and new technologies etc.
	Smart Little People	
	Size-Time-Cost etc.	

Use all the available tools for each stage of problem solving

Before TRIZ no one had looked to systematically summarize all the published solutions to scientific and engineering problems and seek similarities, overlaps and patterns. When the founder of TRIZ, Altshuller, examined patent databases he found only 40 solutions to solving contradictions and a total of about 100 conceptual solutions for improving systems and solving problems which can be used together with the 2500 or so scientific and engineering theories (called effects in TRIZ) to solve problems. Together with his TRIZ community Altshuller developed TRIZ as the ‘science of creativity’ derived from all scientific and engineering success and offered a practical problem solving toolkit for engineering systems. The principal TRIZ tools direct us to find all the ways for improving and solving problems in existing systems and processes. They also help us find relevant concepts to develop the next-generation systems, and they offer systematic processes for inventing and developing new products. TRIZ has simple general concept lists to help us solve any problem; these TRIZ solution triggers are distilled from analysing all known published successful, scientific and engineering solutions. TRIZ tools are unique in their power for problem solving but TRIZ also offers simple tools for problem understanding, for system analysis, for understanding what we want, and for stimulating new ideas, creative thought and innovative solutions.

Who Uses TRIZ and Why?

For good engineers TRIZ offers the best of all worlds: the individual tools are straightforward, the problem-solving process is systematic and repeatable, and when we move fast with TRIZ we can uncover all the possible solutions and maintain and use our brains at their most creative. Engineers understand TRIZ better than anyone else because it comes from engineering success. It was developed by engineers for engineers, and although TRIZ works well on anything, it seems to work best on engineering problems. When first hearing of TRIZ, however, most engineers resist it, perhaps because it sounds too good to be true; but also maybe because it is new to them, not-invented-here and counter-intuitive to the way they approach problems. Unfortunately TRIZ is also seen as just another part of the overcrowded market in corporate toolkits (which range from excellent to trivial). Taking on a new toolkit makes demands on their brain power, company time and money and other hard-pressed resources, and this requires belief in its efficacy and power. Six Sigma and Lean are both promoted to improve efficiency and deliver cost savings and therefore widely adopted – TRIZ also delivers efficiency and similar cost savings plus innovation, fast problem solving and clear thinking. TRIZ is slowly becoming

recognized as a unique addition to all the other company toolkits, as it supplements and complements them all and fills in their missing essentials – the big hole they all possess of no directed problem solving to relevant solution concepts.

One reason cited for the more hesitant uptake of TRIZ is its perceived complexity. This is a misapprehension, as each TRIZ tool is fairly simple and straightforward and learning the entire toolkit should offer no problems for engineers. TRIZ is quite a large and rigorous toolkit but many of the tools overlap, as TRIZ is designed to suit all types of problem solvers. Part of the genius of TRIZ is that it was developed to allow individuals to build their own, personal TRIZ toolkit which suits their problem solving style best. This is a bit like having a well-equipped gym with a large range of equipment – individuals choose and use only part of that equipment depending on what suits them and which fitness problem they are tackling. The TRIZ Toolkit is much the same – there are tools which have specific purposes and tools which an individual finds suit them well, and which they will use extensively.

TRIZ and Other Problem-Solving Toolkits

It is big claim to make that TRIZ is the only toolkit which helps engineers locate all the useful solutions to their problems, and understandably this can create some tension with ‘problem-solving experts’ who use the many other wonderful engineering toolkits. These other toolkits have immensely useful guidance to help us find inefficiencies in processes, the root causes of problems, help us understand all requirements, all stakeholders’ perspectives, what everyone wants, and analyse products, processes and systems, and once we have solutions (for solution finding we’re only offered brainstorming) they help us rank solutions. However, none have anything practical to offer for solving problems, and perhaps should not be labelled as ‘problem-solving toolkits’.

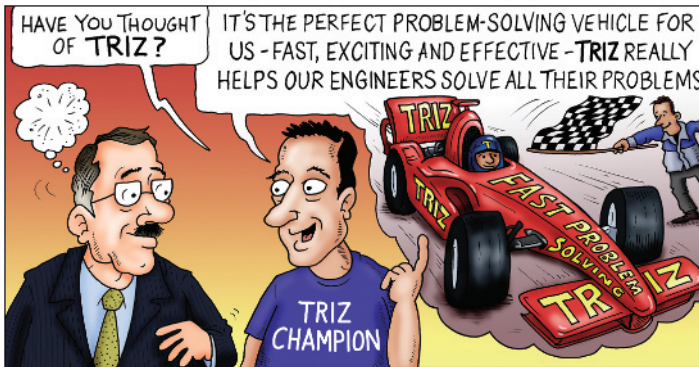


Many good toolkits but none for problem solving

TRIZ is a comprehensive toolkit with simple tools for understanding ‘what we want’ and detailed tools for ‘system analysis’, which are helpful for everything from invention of new systems to improving old ones. BUT unlike any other Toolkits, TRIZ has tools for finding solutions. TRIZ will complement and fill in the gaps (hitherto ignored) of how to actually find concepts to solve problems. The many

engineering quality and production experts who come to learn TRIZ, enthusiastically and thoroughly apply it, and find it is a very valuable addition to whatever toolkit they also use – whether it is Total Quality Management, Quality Function Deployment, Taguchi, Lean, Pugh Matrix, Kepner-Tregoe, 8 Ds, Six Sigma, Value Engineering etc. – especially when they need innovation and want to find powerful solutions.

Other toolkits may offer different and additional benefits such as a more thorough analysis of requirements, or solution selection, but whatever toolkits we normally use TRIZ offers something extra, and powerful and is a good additional toolkit for any engineer.

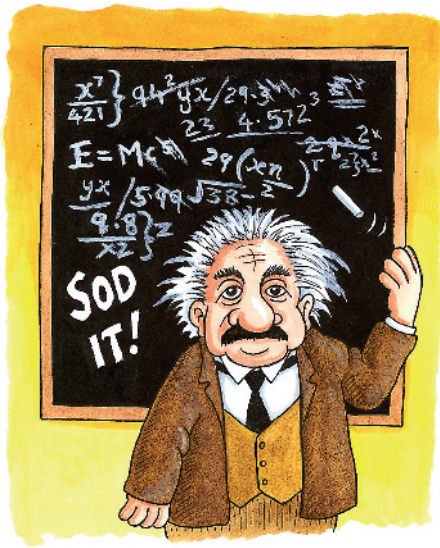


Only TRIZ helps engineers solve problems

One TRIZ delegate, Jon Theuerkauf, Six Sigma expert and Head of Best Practice for HSBC (Jon is now Credit Suisse's Head of Centre of Excellence), explained 'At the beginning of the TRIZ Workshop I said, "There is nothing new under the sun" as I thought I knew most problem-solving toolkits and was sure that TRIZ would just contain the same tools as all the others. TRIZ showed me something "new under the sun" with its unique problem-solving tools of the 8 Trends, 40 Principles and Standard Solutions. I am impressed and I am not easily impressed.'

Innovation – Fool's Gold or TRIZ?

Innovation has been in fashion for a long time – and heads up company value and mission statements – and unlike other trendy corporate initiatives has not peaked and faded. Probably because like searching for the philosopher's stone, most companies have never found how to systematically locate useful innovation to achieve its promise of success and hopefully endless future riches; practical, sustained innovation remains elusive to most companies. Corporate culture innovation initiatives often establish the need for innovation, identify innovation gaps and stimulate the desire to close those gaps. There are many innovation departments and consultancies with smart presentations, articles and conference talks telling us that innovation is needed more than ever, especially in difficult times and as the pace of new technologies increases etc. Non-TRIZ innovation toolkits are mostly brain-provocation exercises – helping to create new viewpoints of problems, clearer understanding and provoking ideas by stirring up or helping recall what we already know – and offer innovation by suggesting different combinations of known entities. Companies looking for innovation often keep asking the same questions over and over again ... hoping that it will somehow get different answers (close to Einstein's definition of insanity). Although 'innovation' is blazoned across corporate values, mission statements, slogans and encouraging, motivational material, it is hard to achieve, apart from those companies who have embedded the TRIZ toolkit to deliver technical and business innovation.



Einstein said that the definition of insanity is to do the same thing over and over again and hope for different results. He also said 'If at first, the idea is not absurd, then there is no hope for it' which is very aligned to TRIZ thinking using the **Ideal Solution** which helps to shoot us away from our comfortable problem definition and solution places and suggest new definitions for the problem and different solutions far from our previous positions. If a solution is wild and wacky we should not instantly reject it – but look for the good and the benefits it delivers. Negativity or psychological inertia will help us reject new ideas and suppress innovation – TRIZ offers tools to combat these.

'Einstein develops his theory of negativity.'

Psychological Inertia can happen to anyone

What does TRIZ Offer?

TRIZ Delivers Systematic, Guaranteed Innovation and Creativity

By helping us to find all the solutions to problems and new concepts TRIZ delivers systematic innovation. By learning TRIZ and following its rules many companies have found that they can accelerate creative problem solving for both individuals and project teams. Such companies who successfully encourage and apply TRIZ can demonstrate that the spectacular results they obtain reflect that they are using the success and knowledge of the whole world, and not merely the spontaneous, random and occasional creativity of individuals or groups of engineers within their organization.

TRIZ – Helps Us Understand the Problem and All its Solutions

TRIZ will help us ask the right questions and locate most, if not all, of the solutions including those we have within our knowledge and experience and others beyond that which we didn't previously know about (delivering innovation). Most companies find TRIZ will give them the many new answers they are seeking, and feel confident that they have covered all the possibilities for new solutions. In a wide range of industries from nuclear clean-up to new medical devices TRIZ has been helping teams locate many good solutions, delivering high patent rates, intelligent choices and confidence of a good innovative strategy for future business.

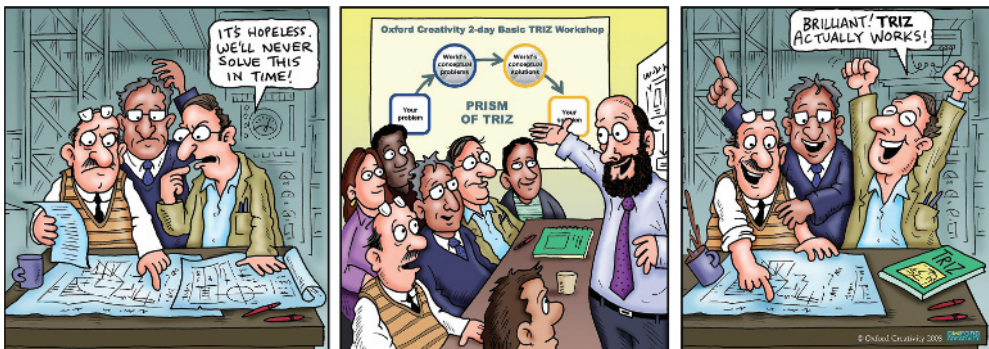
TRIZ Simplifies Systems to Maximize Benefits and Minimize Costs and Harms

This is fundamental to the TRIZ approach of seeing how to achieve the greatest benefits for the least costs and harms. One evolutionary trend in engineering is to complicate systems as they develop and

offer more functions and then later simplify them without losing any functionality; TRIZ suggest ways of moving straight to the high functionality delivered by a simple system. This is almost an underlying philosophy of TRIZ and offers many tools to assist this process. Called TRIMMING it is the TRIZ approach to systematically simplify systems while retaining all functionality.

TRIZ Helps Us Overcome Psychological Inertia

Engineers love finding good solutions and TRIZ offers systematic routes towards the solution places and in addition offers ways of breaking any mental habits which prevent innovation, clarity of understanding and thought, or keep us stuck in the same old solution space. In TRIZ this is called 'breaking psychological inertia' and the TRIZ tools to help us include Thinking in Time and Scale, Ideal Outcomes, Smart Little People and Size-Time-Cost. TRIZ also gives a confidence that confusing, more difficult, complex problems can be systematically understood and solved. The TRIZ problem understanding and solving processes build habits of asking the right questions at the right levels and subduing complexity, whilst the TRIZ creativity tools shake our brains, attitudes, prejudices and help us seek new areas, new ideas, new solutions and helps make us creative and innovative.



When all seems lost – try TRIZ

How TRIZ Works

TRIZ offers us clarity of understanding of problem situations and solution triggers to help us solve problems. TRIZ has a set of simple but powerful tools that take us from a problem situation to a problem model – which is focussed only on the relevant part of the problem – exactly where and when the problem is occurring. This drilling down to the exact problem area to define the problem requires a very exact understanding of the problem and its context. Once the problem is accurately defined TRIZ offers matches of problem solutions to problem types. For example if the problem contains something that is harmful then TRIZ offers all the recorded solutions to dealing with harm at a very conceptual level such as stop, eliminate, correct or transform into good.

The Golden Rule of TRIZ

There is one essential TRIZ tool which is fundamental to all approaches to problem solving. This is the IDEALITY Equation which is the starting and end point of all problem solving. Ideality is like the

Golden Rule of TRIZ – and improving Ideality is the aim of all problem solving, i.e. achieve more benefits, less costs, less harms.

Ideality = All Benefits (Primary + Secondary Benefits i.e. all outputs we want)

Costs (all inputs) + Harms (all outputs we don't want)

All the other TRIZ tools are there to improve Ideality, in this book Ideality terms are used such as Ideality Balance – a positive Ideality Balance means a product is viable and achieving market acceptance (its benefits exceed its costs and harms). An Ideality Audit is a complete check of all inputs and outputs of the system we've got compared to the system we want, and Ideality Tactics describe the various processes/sequences for combining relevant TRIZ tools to solve particular problems.



The great TRIZ Toolkit – every player is needed

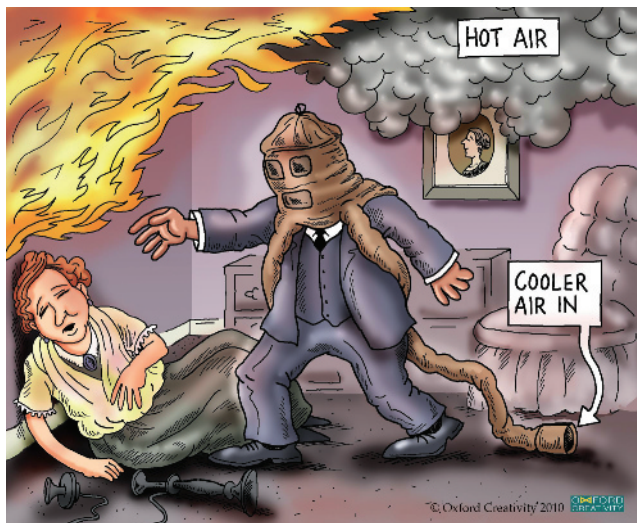
The TRIZ Toolkit

The TRIZ Toolkit is straightforward and although rigorous and powerful is still fairly easy for engineers to learn and apply fairly quickly. The main tools include:

- **40 Principles** for solving contradictions accessed through the **Contradiction Matrix** and **Separation Principles**
- **8 Trends of Evolution** for perfecting systems – used for future system development
- **Effects** – engineering and scientific concepts arranged for easy use. A simple list of questions and answers to access all the relevant technical and scientific conceptual answers – a list to deliver all the ways to solve problems without technical language or jargon. (see www.TRIZ4engineers.com)
- **Thinking in Time and Scale** for problem context, understanding and solving (9 boxes)
- **Ideal – Ideality, the Ideal Outcome, Ideal Solution, Ideal System and Ideal Resources** for understanding requirements and visualizing solutions

- **Resources and Trimming** – for clever and low cost solutions
- **Function Analysis and Substance Field Analysis** – system analysis for understanding the interrelationship of functions
- **Standard Solutions** – for solving any system problems. Creating and completing systems, simplifying systems, overcoming insufficiency, dealing with harms, future development and smart solutions for technical problems.
- **Creativity Triggers** for overcoming psychological inertia and for understanding systems and visualizing solutions including Size-Time-Cost and Smart Little People

The unique parts of the toolkit are the solution tools (40 Principles, 8 Trends, Standard Solutions and Effects) and the tools to access these solutions which include the separation principles, contradiction matrix, function analysis and substance field analysis. These are used to solve engineering problems – especially difficult ones which have resisted the usual brainstorming methods. In addition are the amazing TRIZ thinking tools which once learned are used daily and deliver clarity of thought and effective approaches to both problem understanding and solving. The most popular is ‘Thinking in Time and Scale (9-Boxes)’ a powerful tool which delivers great mental clarity. Imagining Ideal Solutions or Systems is very much part of the TRIZ thinking for both capturing all benefits and seeing how to deliver them for the least cost and harm. Fundamental to this approach is reducing costs by delivering essential functions using available resources. Good TRIZ thinkers conjure up such Ideal Systems – which is also the natural territory of great inventors. One example of an Ideal System was created by Garrett Morgan – the Safety Fire Hood which he invented in 1912 to help fire-fighters. The hood is designed to supply cool air in a smoke-filled room and cleverly uses available resources because it has a long inlet tube at ground level (where the air tends to be cool as smoke and fumes rise in a fire).



Cleverly matching available resources to deliver good solutions is fundamental to TRIZ

One great strength and problem of learning TRIZ is that we each like different tools and each have slightly different TRIZ toolkits. The TRIZ Tools are all different but some overlap and duplicate each other because they are designed to suit different styles of problem solving. Most of us will only need

and will use about 80% of the tools; we will reject the ones which don't suit us but still have a complete TRIZ toolkit. Which 20% we reject depends on each person. TRIZ offers a complete toolkit for everyone, no matter what their learning styles, preferences or experience. TRIZ achieves this by having a wide-ranging toolkit which contains tools to suit all situations and approaches. The genius of the toolkit is that it has tools for all problem-solving types, and allows each of us to build the toolkit which suits us best. However it is important to learn and use all the tools so that when working in TRIZ teams we can work together effectively, and not reject too many tools. There is a danger of becoming familiar with a small number of the TRIZ Tools and only using them – and some TRIZ gatekeepers insist that everyone else in their company limits themselves to their particular choices – which is like playing only three players in football and keeping all your best talent on the reserve bench.



Gatekeepers limit their corporate TRIZ to their favourite tools & keep much huge talent on the bench

Many of the TRIZ Thinking Tools are very simple brain prompts and can be learned in a few minutes such as Ideal Outcome, Smart Little People and Size-Time-Cost. Some of the analysis tools take longer to master such as the Separation Principles and the Contradiction Matrix but reward any investment of effort as they offer routes to locate all the known ways to create systems which deliver contradictory solutions.

The Toolkit Chart

Table 1.1 is a complete chart of the TRIZ Toolkit. The horizontal axis of the chart shows the TRIZ Tools and the vertical axis shows all that TRIZ delivers.

Which Boxes should be Ticked?

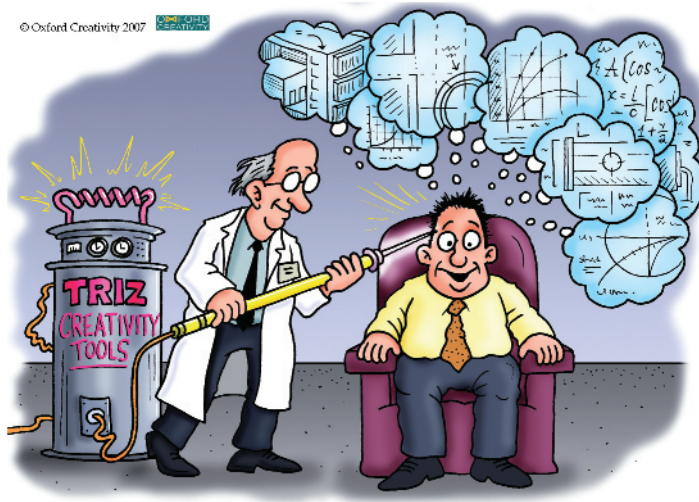
I could put marks in the boxes based on what I have seen work in problem-solving sessions for ten years. Each of my TRIZ colleagues would mark a slightly different set. In a sense every box could be ticked as all the tools can be used in many ways. The ticking of the boxes of which tool when would vary from person to person, and when I fill the chart in for myself it is based only on my experience. Academic study is needed about where and how the TRIZ Tools deliver the best solutions and how to comprehensively complete the chart below.

		TRIZ Toolkit						
TRIZ guides us to achieve the following benefits		Ideal Outcomes, Benefits, System, Functions & Resources	Resources	Thinking in Time and Scale (9boxes)	BAD Solutions Locate and develop solutions (which have GOOD & BAD within them)	Solution Park Locate and develop solutions for transformation with TRIZ to better ideas	Prisms of TRIZ Concept solutions to concept problems	Analogy Use and learn solutions from others
Understand & Solve Problems	1	Solve / eliminate Problems						
	2	Get the functions right & deliver all the right functions						
	3	Deliver opposite benefits (solving physical contradictions)						
	4	Reduce costs						
	5	Simplify systems						
	6	Improve systems						
	7	Improve / make something better without downsides						
	8	More benefits						
	9	Less inputs						
	10	Less harms						
	11	Understand and map essential requirements						
	12	Define and locate problems						
	13	Detect problems						
	14	Understand and map the context for problem situations						
	15	Choose the right directions for problem solving						
	16	Locate and recognise available resources						
Invent, Locate Future & Next Generation Systems	17	Forecast future products						
	18	Invent systems						
	19	Next stage and next generation of all or parts of technical systems						
	20	Match new technologies to unfulfilled needs						
Team Building, Innovation & Creativity	21	Audit Innovation						
	22	Understand the relevance / context of our own and other's work						
	23	Work well in teams						
	24	Co-ordinate work and ideas						
	25	Share knowledge / solutions & respect each other's solutions						
	26	Access relevant, good, innovative solutions to problems						
	27	Generate solutions from within our own brains						
	28	Locate solutions previously unknown to us						
	29	Access relevant world knowledge						
	30	Sort / Map solutions						

Table 1.1 TRIZ Toolkit chart

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TRIZ Creativity Tools



TRIZ wakes up your brain

The TRIZ Creativity Triggers complement all the other TRIZ tools and can be used on their own or kept as part of the waiting and available toolkit to be used as and when appropriate.

TRIZ Creativity Triggers (to be applied at any/all stages as required)

1. Define and seek an *Ideal Outcome* which solves the problem itself.
2. *X-Factor* – Imagine something which solves the problem.
3. *Thinking in Time and Scale* – Nine Boxes Maps (*Time* steps Before, During, After. *Scale* – zoom in and out – look at the details and the whole context to understand the problem situation and see all possible solutions).
4. *BAD Solution Park* – Capture all IDEAS – everyone's BAD solutions (even if unusual or unattainable etc.).
5. *Subversion* – Try the solution the other way round – Invert it – try the opposite.
6. *Prism of TRIZ* (understand essential problem and see if someone else has already solved this problem).
7. Model the problem and solutions with *Smart Little People*.
8. Apply *Size-Time-Cost* (exaggeration thinking tool).
9. *Simple language* (no technical jargon or acronyms to obscure simple truths).
10. Look for *Life and Death analogies* (Has someone got solutions which are to them critical and therefore very good?).
11. Distil solution IDEAS to the CONCEPTS behind them, multiply solutions with more Ideas for each concept.
12. *Ask Why?* To identify benefits instead of features or functions.
13. *Combine* all the good from various solutions (e.g. create a carrot–cabbage with edible roots and leaves).

The TRIZ Creativity Triggers are simple and powerful and help us to:

- think fast and powerfully – all are good brain prompts;
- understand and define what we want;
- reveal requirements – everyone's needs are made clear;
- understand the system and its problems;
- prompt our brains to find lots of solutions;
- overcome Psychological Inertia;
- deliver clarity of thought;
- locate different solutions;
- see others' viewpoints.

Creativity Prompts – Smart Little People and Size-Time-Cost

How to model problems and solutions with Smart Little People and applying Size-Time-Cost to problems are shown below. The rest of these Creativity tools are dealt with in subsequent chapters.

Smart Little People (SLP)

This powerful and simple TRIZ Creativity tool can be mastered in a few minutes and is thereafter forever useful. Smart Little People are imaginary tiny beings who represent the different elements of the problem we are trying to understand and solve. It works as a mental trick because it is based on empathy, or creating some personal analogy with the problem. Empathy means becoming the object/problem and looking to see what can be done from its position and viewpoint. If we imagine ourselves becoming so tiny that we are in the problem area and seeing the problem in great detail then this can be useful and harmful. This is useful for problem understanding but harmful because may we resist solving a problem if the solution means ourself, as a tiny being, is going to be destroyed, dissolved in acid, mashed up, dissected, boiled etc. This is overcome by using a crowd/multitude of disposable Smart Little People, for which we feel no responsibility, based on the premise that 'A single death is a tragedy – a thousand a statistic.'

Smart Little People works by modelling the different aspects of the problem (causes and solutions) with different groups of rival or complementary Smart Little People. They are *Smart* because they have the ability and insight to create/solve problems and be anywhere, doing anything. *Little* means they are as tiny as necessary – molecular level if required. Rival teams of smart little people can be created and some can cause the problem and others solve it; they do whatever is required even if this means they get destroyed. Figure 1.1 uses SLP to illustrate a composite material.

Model the Problem with Smart Little People

We draw the Problem Zone by using SLP to model the problem and the causes and conditions and solve it. When this is used in engineering problem solving it can be met with a certain sneering incredulity that such a simplistic tool can possibly help with a serious technical problem. I remember working with a team of fairly curmudgeonly, oldish, experienced engineers on a very serious and public problem of the leaking of engine oil in passenger planes contaminating cabin air. When the oil appeared in the cabin air of the aircraft it caused sickness and fainting and the problem was threatening safety and generating lawsuits.

It was a three-week session (working on two very different problems simultaneously) and about halfway through I suggested that we model the leaking oil molecules as Smart Little People and track and draw their progress from the engine to the cabin. This was greeted with some hilarity by the engineers who

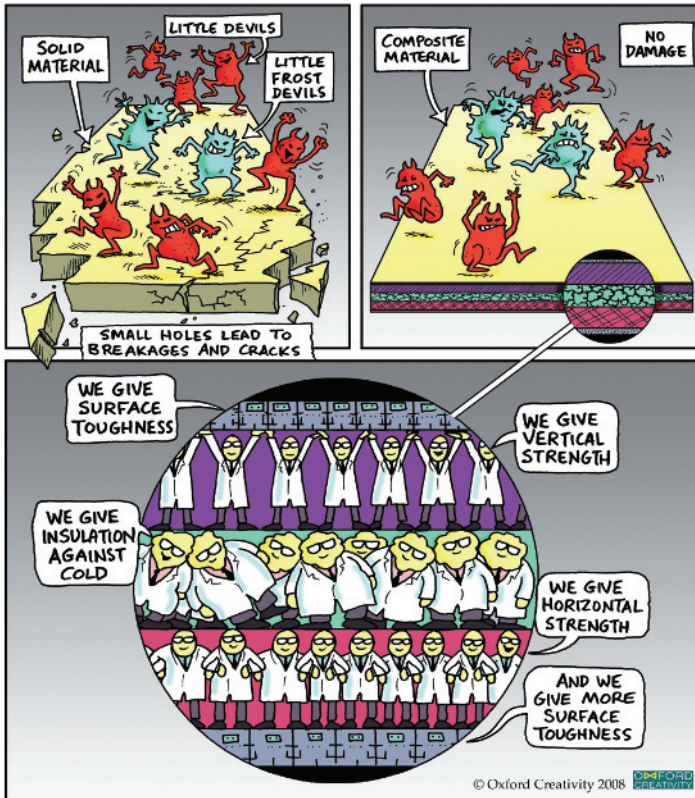


Figure 1.1 Using Smart Little People to illustrate a composite material

grudgingly undertook the task but with typical engineering thoroughness and accuracy. This was very effective and productive and mapped at least seven good places where we could deal with the problem; the models we produced delivered such clarity of understanding that progress became very rapid. For safety the problem was solved in a number of places but the one cause of the problem was the use of synthetic oils, which are much more toxic in cabin air. The solution suggested was less use of synthetic oils. (I was also working on a problem with another company about reducing problems of carbonization of oils. Again great clarity of understanding was achieved by modelling with SLP and for this the solution was to use only synthetic oils in aero-engines.) SLP helps show the causes of simple and complex problems.

Altshuller's Famous Use of Smart Little People

In much of the TRIZ literature is the original famous Altshuller example of how he designed a perfect marine cable to prevent tethered mines in the sea from being detected and removed.

As shown in Figure 1.2, minesweepers are used to destroy mines at sea by dragging a loop of cable which ensnares the mine retaining cable. The mine then detonates or floats to the surface. Altshuller's challenge was to design a cable which would tether the mine to the seabed but also allow the mine-sweeper cable to pass through it. Altshuller drew the zone of conflict as if with populated the smart little people, and by imagining a tiny person holding the feet of the tiny person above he saw the answer (Figure 1.3).

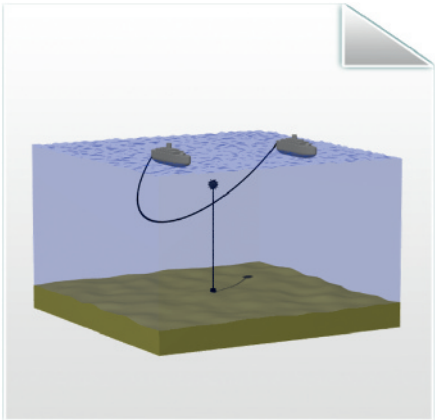


Figure 1.2 Minesweepers

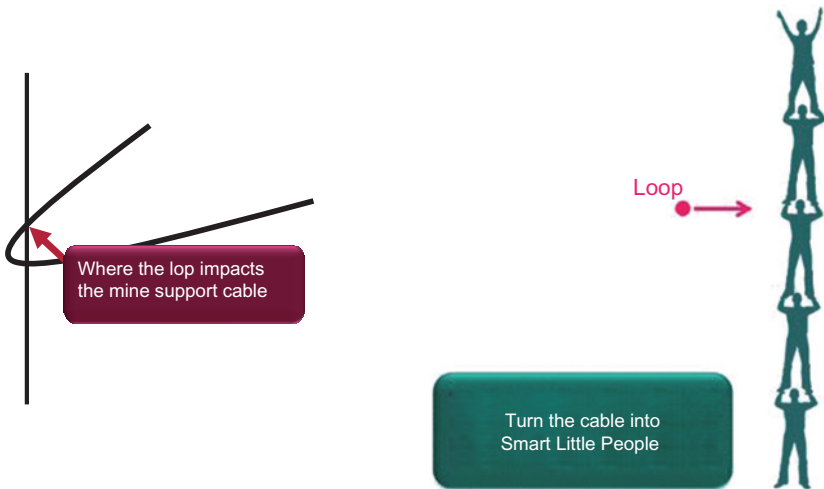


Figure 1.3 Altshuller's challenge

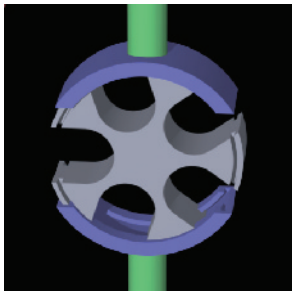


Figure 1.4 Altshuller's answer

The device which was developed and is now widely used works like a rotating door (Figure 1.4). It is based on the principle of the smart little person letting go with one hand to let the cable pass through while still hanging on with the other hand. Then rejoining the first hand and letting go with the second hand so the cable passes through but the vertical link is always maintained.

Size-Time-Cost for Visualizing Solutions

This is a very powerful tool for stimulating new solutions and overcoming Psychological Inertia as it shoots us away from our current solutions and narrow image of the problem, and re-constructs it in an extreme and different way.

Size-Time-Cost simply suggests that we take our problem and exaggerate all possible options and then consider the prompts we would get if we exaggerate *size* (make very big and very small), *time* (very fast and very slow) and *cost* (spend lots and spend nothing). These are six extreme places to look for solutions; they effectively and instantly stretch our imaginations to visualize new solutions.

Six simple steps:

SIZE	Increase to Infinity	Reduce to Zero
TIME	Take forever	Move infinitely fast
COST	Unlimited budget	Spend nothing

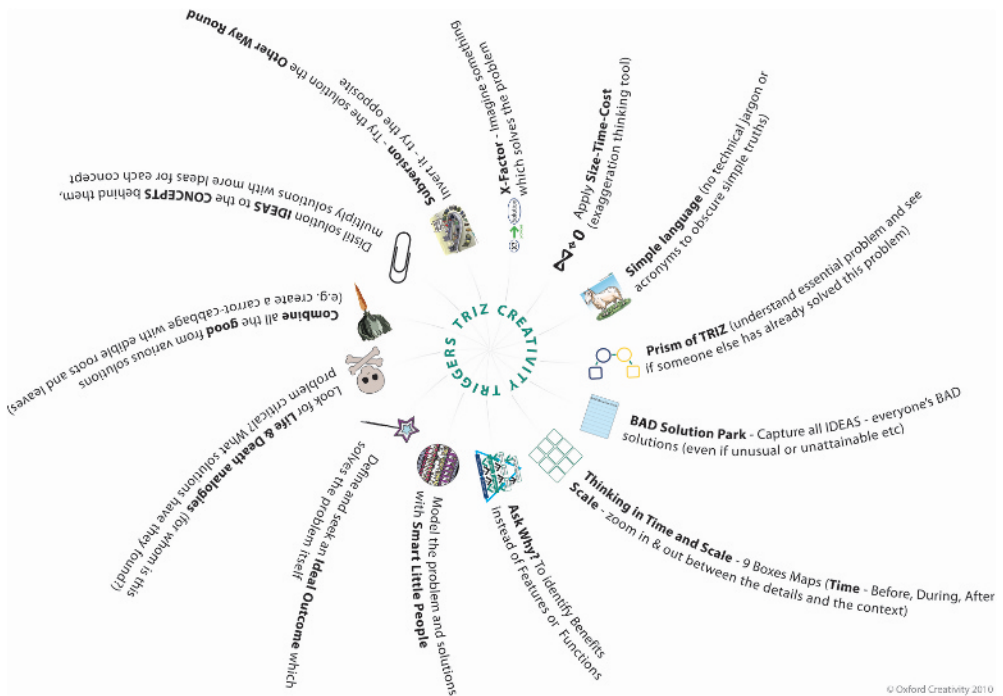
This could be applied to anything. Imagine designing a new system for self-propelled travel (instead of a bicycle, scooter, roller blades, skate board or a wheelchair). Apply Size-Time-Cost to this problem and visualize some innovative ideas and systems which could solve this problem.

Problem Challenge

Apply Size-Time-Cost and imagine solving the problem of self-propelled travel by trying six solution types, making the device:

Very Large	Very Tiny
Very Fast	Very Slow
Very expensive	Very inexpensive

Write in all ideas which occur including ‘wacky and wonderful ideas’ for all six of the extreme solution places and then see if those extreme ideas suggest any practical and real solutions which could be explored. This is just one of the TRIZ Creativity Triggers. When thinking of solutions it may be worth trying all the other solution prompts.



The TRIZ Creativity Triggers should not be in a list which implies priority but in a circle or mind map

TRIZ for Everyone – No Matter What Your Creativity

The simple tools of Smart Little People and Size-Time-Cost are easy to learn and apply and stimulate our understanding of problems and help us visualize and imagine solutions. They are both powerful and useful and just two tools of the thirteen or so in the TRIZ Creativity Triggers. They aid our creativity and help us to think quickly and clearly.

Altshuller developed these tools while working with his engineers, training them in TRIZ and in response to what was happening in live problem-solving sessions – he ‘bottled’ the simple but practical ways to stimulate clever ideas.

Altshuller once said that TRIZ made the very creative people three times more creative but the non-creative people were made ten times more creative. Altshuller had studied the differences between different creative abilities and developed TRIZ as a universal tool-kit and process for many different types of problem solvers.

Clever and motivated engineers approaching TRIZ will eventually use about 50–80% of the TRIZ tools to help them solve problems – but everyone builds their own individual TRIZ toolkit and there are many variations. TRIZ was designed to do this and developed to cover many different thinking styles, with tools to help everyone quickly and effectively move from problem to the best solutions. Some people don’t need so many of the tools because they are instinctive TRIZ thinkers. For those of us who lack this marvellous ability Altshuller uncovered the instinctive processes used in quick and clever thinking. He built TRIZ tools to help anyone do the clever thinking by stepping through it slowly, consciously and systematically to cover every stage of the problem-understanding and problem solving process.

We are now benefiting as our engineering communities can learn to quickly and effectively TRIZ problem-solve, using less resources and more ingenuity – theirs and other people's. Although TRIZ initially may seem complex because there are many tools, and these overlap significantly, each tool is simple to understand and some tools can be applied immediately after only a few hours of learning and practice. The basis of TRIZ is to encourage everyone in a team to come up with as many good ideas and solutions as possible, combining the best of each as appropriate to eventually find good solutions to any problem.

TRIZ can help us:

1. solve problems
2. think clearly, powerfully and see the wood for the trees when confronted with a complex problem situation
3. be creative (invent new systems, find next generation systems, come up with lots of new ideas etc.)
4. be innovative (find new ways of using existing systems, existing technologies etc.)
5. get teams to work together to pool their brain power and experience, enhanced by the distilled world's knowledge of the TRIZ tools
6. improve existing systems and increase the ideality of systems by lowering costs, removing harms or increasing benefits
7. use our resources: we can often find quick, cheap solutions to problems
8. get quick solutions
9. get a structure to brainstorm around difficult problems – even with those unfamiliar with TRIZ
10. structure and use our thinking time effectively – we know that we'll be looking in the right direction and places
11. turn harm into good

And can't ...

Solve every problem – although it can solve most

Replace our brain power – there is still a creative leap required – it's just much smaller than the leap we'd have without TRIZ

Tell us which TRIZ tools to use when – we need to learn the tools and the process and intelligently use both

Churn out solutions – it will only give us triggers – we still have to work and think hard, but we know that we'll be going in the right direction to the right places.

Reasons to use TRIZ

TRIZ is systematic, auditable and repeatable

During problem-solving sessions, we may uncover some great solutions without using TRIZ. Using TRIZ will not only uncover all the good and bad solutions we would have found anyway, but many more, and will ensure that no solutions are missed. We will always come out of a problem-solving session with several workable and good solutions.

TRIZ is based on proven successful patents

So we know they work – there is less risk involved in using an existing technology or technique in a new field than developing our own custom-made solution.

TRIZ uses the world's knowledge

Brainstorming and other techniques randomly help unlock some of the knowledge in the room; TRIZ helps us systematically unlock our own knowledge and helps us intelligently access the relevant world's knowledge.

We can build our own toolkit from the TRIZ tools

We show the principal TRIZ tools, but we don't have to use them all. Everyone finds tools that they prefer, and then sticks to the tools that work best for them: we don't have to bend our way of thinking and working around an inflexible toolkit.

TRIZ is quick

Like any new skill we have to practice, and at first we may go slowly. However, once we've become familiar with the tools, we will start using them automatically and problem solving will become quicker and more effective.

It can be used in groups

Having one or two TRIZ-trained people in a large group can facilitate incredibly effective, structured brainstorming sessions, because they can focus the group's attention on a few key areas that they know will lead to good solutions.

It's not just for engineers

The principles of TRIZ apply to any problems, or situations that need more innovation and creativity, and have been used to great success to solve management problems.

It doesn't often need software – just your brain power and the TRIZ processes

Learn TRIZ properly and separately from the software companies before trying any TRIZ software. Software can impede good TRIZ thinking and hinders working well in groups to solve problems. I know less than five enthusiasts who once having learned TRIZ, use the software rather than the thinking skills of TRIZ. I know many more people who have the software on their laptops and rarely use it when problem solving with TRIZ. There are a number of software packages on the market. Mostly they distort TRIZ to make it fit with some software vision. The software may well get in the way and hinder rather than help. Getting started with TRIZ problem solving is the hardest part – learning and using the software and then entering things into a software package can give the illusion that we are doing something useful. If we need handholds because we are uncertain (or feeling sluggish) then use the excellent free TRIZ problem processes and packs.

TRIZ Processes are explained in this book

All the TRIZ problem-solving routes are shown in this book. They are easy to use, also there are Ideality algorithms which offer thorough understanding of what we want (all requirements), TRIZ system analysis, problem definition (the gaps between our requirements and what the system delivers, i.e. the problems) and finally to problem solving using the excellent TRIZ problem-solving tools, which software packages may claim to have enhanced, but in reality expand the detail and blur the simplicity of TRIZ.