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Lilly Haines-Gadd

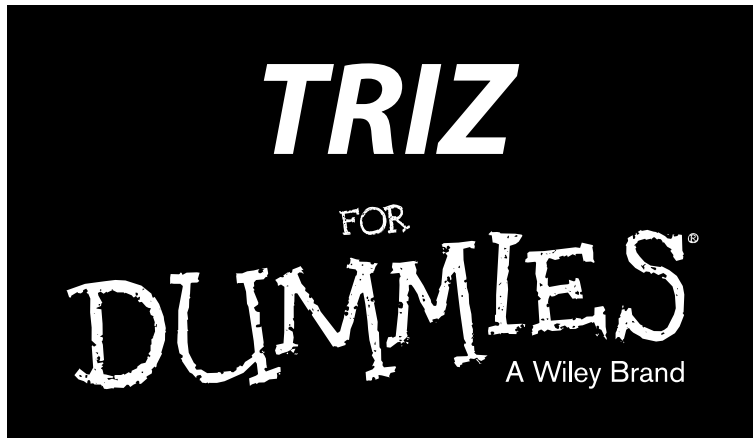


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by Lilly Haines-Gadd



TRIZ For Dummies®

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Introduction

Are you looking for a better way to solve problems or interested in developing your creative ability? Or are you seeking a method for generating innovative thinking, in yourself and in the team around you? Perhaps your organisation has become so lean and efficient that you don't know how to get people thinking innovatively again. Or maybe you want to find a way to encourage everyone to share and develop ideas together as a team. If any of these ring true, or you're just looking for a novel new way of navigating the many rapids you encounter along the river of life, TRIZ will help you. You've come to the right book!

TRIZ is the outcome of extensive research into patents and scientific journals. It has a wonderful engineering and scientific pedigree, and as a result, many case studies and examples you'll hear about are technical.

However, and this is the important thing, it works – and I've seen it work – on any kind of problem: management problems, business problems, social problems, even personal problems. What TRIZ gives you is the ability to think very clearly and creatively. You unpick thorny issues, define your problem correctly and are then given useful suggestions regarding how these problems may be solved. You use your brain to the best of its ability and, in fact, many of the TRIZ tools are based around changing the way you think by repeating the thinking patterns of the most creative and successful problem solvers. These principles are helpful regardless of the subject matter.

TRIZ gives you both skills in creative thinking and confidence in your creative ability. After reading this book you'll be able to put some TRIZ magic into practice and enhance and extend your natural creativity and problem-solving ability.

TRIZ is a Russian acronym that stands for 'Teoriya Resheniya Izobretatelskikh Zadatch', which translated into English means 'Theory of Inventive Problem Solving'. As this is a bit of a mouthful, we generally use the acronym, but it's helpful to know what it stands for; in fact, TRIZ is more than just a theory, it's a practical toolkit, a method, a set of processes and even a bit of a philosophy to help you understand and solve problems in clever ways.

Genrich Altshuller, the mastermind behind TRIZ and a very clever engineer, scientist, inventor and writer (of both TRIZ books and science fiction), asserted that 'anyone can be creative'. TRIZ shows you how!

About This Book

This book isn't the ultimate guide to TRIZ. Instead, it gives you a short (and hopefully fun) introduction to the TRIZ tools and processes, based on how it can be used (and how I use it at work), rather than explaining every detail of the theory. You can start anywhere because each chapter stands alone and provides insights into new ways of thinking about problems and finding solutions. As you read you'll come across occasional sidebars, which contain additional information about the topics at hand (and, if you're lucky, the occasional joke). Reading these is optional because they're not necessary to understanding the main text.

Most books about TRIZ are written from a technical starting point. I read many when I first encountered TRIZ but found them hard to read, because most of the examples were based on engineering problems that I struggled to understand. Even the non-technical examples were often described in language that seemed very technical to me (most TRIZ experts are engineers) and didn't reflect how simple the tools can be to pick up and use – for anyone. So in this book, I make things as straightforward as I can.

As TRIZ has always been used for any kind of problem solving, I thought it was time for a general book that even a dummy like me would understand. To that end, every example is general and non-technical. Even when I describe a technical system, I use everyday items that you've probably used, such as a cheese grater or toilet brush (not together!). I'm regularly asked, 'Will TRIZ work for me even though I'm not an engineer?' I wrote this book to (hopefully) show you that the answer is *yes!* And to start to show you how.

Because I describe things as simply as possible, I may use slightly different terminology to what you might find elsewhere. TRIZ was first conceived in Russian and then translated into other languages, not always consistently. On top of that, it's developed by a whole community, not one individual, and isn't owned by any one person. As a result, a number of different terms are used for the same tools, and some tools are arranged in different ways. Some derivative approaches also exist, whereby people have tried to extend or develop TRIZ and created their own toolkits and methods as a result. In this book, I describe 'classical TRIZ', which is based only on the framework developed in the original research.

The terminology in this book is based on the Oxford TRIZ approach: classical TRIZ described simply (with nothing added or taken away).

Foolish Assumptions

I make only one assumption about you: that you're interested in learning something new. This is the first step to thinking creatively and becoming a better problem solver – and you've demonstrated it very effectively by picking up this book!

Your expertise or discipline is irrelevant; however, some of the technically based tools are easier to grasp if you have some technical knowledge or at least an understanding of how the physical world works, that is, an interest in science. That said, the examples I use are broad enough that anyone will get them – I wrote the book for a dummy like me, after all!

The only other useful attribute is that you've encountered problems, but then, who hasn't?

Icons Used in This Book

To help you pick out the information most useful to you, I've used a few graphical icons in the book to highlight key details. Whenever you see the following icons in the margin, this is what you can expect from that paragraph:



A TRIZ tip or trick for improving your thinking or developing your problem-solving skills.



This icon reminds you of something that you should bear in mind when applying a specific bit of TRIZ thinking.



This icon warns you of common mistakes or pitfalls that could trip you up when you're applying TRIZ to a problem.



Throughout the book, I've included helpful real-life examples. Many other TRIZ books focus on engineering problems, but I've applied my TRIZ examples in a broader context.

Beyond the Book

In addition to the material in the print or e-book you're reading right now, this product also comes with some access-anywhere goodies on the web. Check out these features:

- ✔ **Cheat Sheet** (www.dummies.com/cheatsheet/triz): A handy little guide to refer to as you read through this book.
- ✔ **Dummies.com articles** (www.dummies.com/extras/triz): You can also find relevant online articles that supplement each part in this book with additional tips and techniques.

Where to Go from Here

If you're not sure where to begin and don't fancy the usual practice of 'Start at the beginning', here are my top suggestions:

- ✔ The 40 Inventive Principles are the most famous TRIZ tool, and are used to solve contradictions. Chapter 3 is a good place to start as it gives you not only an overview of this popular and powerful tool but also some background into the logic of TRIZ.
- ✔ If you work on developing new products, Chapter 4, which covers the Trends of Technical Evolution, shows you the likely directions your systems will take in the future.
- ✔ Chapter 7 offers a good introduction to the psychological blocks to creativity and how to get over them, using the suite of TRIZ creativity tools.
- ✔ Chapter 8 introduces Thinking in Time and Scale, a deceptively simple tool for stretching your thinking, restructuring your view of a problem and generating innovative solutions.

Having said that, you can start at the very beginning because, as the fresh-faced trainee nun in *The Sound of Music* says, 'it's a very good place to start'!

Part I

Getting Started with TRIZ



Visit www.dummies.com for free access to great Dummies content online.

In this part . . .

- ✓ Get an introduction to the TRIZ tools, process and fundamental logic of innovative problem solving.
- ✓ Understand the TRIZ philosophy and learn how to start thinking like a genius.

Chapter 1

Going from Zero to TRIZ

In This Chapter

- ▶ Appreciating the powerful TRIZ logic
 - ▶ Getting going with TRIZ problem solving
 - ▶ Developing ninja problem-solving skills
-

We've all got problems, right? And largely we can work out how to solve them, even when the problems seem really tough. Human beings are designed to be problem solvers, and we're generally really good at it, so why do we need to go back to the drawing board and learn a new way to tackle problems?

Well, because it's possible to learn from each other – and from problem solvers in the past. TRIZ is an attempt to try to cut across different disciplines and 'bottle' the fundamental logic of problem solving for everyone no matter what their job, speciality or area of expertise.

The greatest achievements in the arts and sciences have come about because people have been able to build on the previous work of others. When developments and breakthroughs have occurred – whether the drawing of perspective in art or the theory of gravity or the discovery of DNA – they've been shared so they can be built upon rather than rediscovered over and over again. However, these developments, and the preceding problems and solutions, are typically described in the language of the discipline in which they happened. As a result, only people with specialist knowledge are truly capable of understanding these developments. While this situation's great for them, it cuts out everyone else. Because problem solving is seen as being specific for each discipline – the assumption being that lawyers, for example, must face very different problems to chemists – people tend to stay within their own industry and field of expertise when they face problems and are looking for solutions.

TRIZ takes the opposite approach.



One of the cornerstones of TRIZ is that the same problems occur again and again across different disciplines and applications, and that people are constantly reinventing the wheel by solving them from scratch every time. At the heart of TRIZ is the belief that, if you can understand how your problem is similar to someone else's, you can reapply his clever solutions.

When you use TRIZ, you're able to access the clever thinking of genius problem solvers from all areas of science, engineering and technology and can reapply what they've learned. You don't reinvent the wheel – you find new and exciting ways of and ideas for using clever existing concepts to give you what you want.

And generating new ideas *will* be very easy for you because you have TRIZ. If you need solutions to a problem, you can just apply a simple thinking tool. If you hit a dead end, hit the problem with TRIZ. If you have a solution that looks pretty good, improve it even more by teasing out its problems and solving them. You can always do more TRIZ, which means that solutions and improvements are always out there to be discovered. It's an exciting journey, and you and the people you're making it with will appear to be geniuses as you find the right solutions to all the problems you encounter along the way.

Getting to Know TRIZ

TRIZ subdues complexity and keeps detail in its place. TRIZ logic demands that you have a clear idea of where you are and where you're going, which helps you keep your eye on the prize and avoid getting tripped up with irrelevant detail, waylaid by trivial issues or seduced by premature solutions.

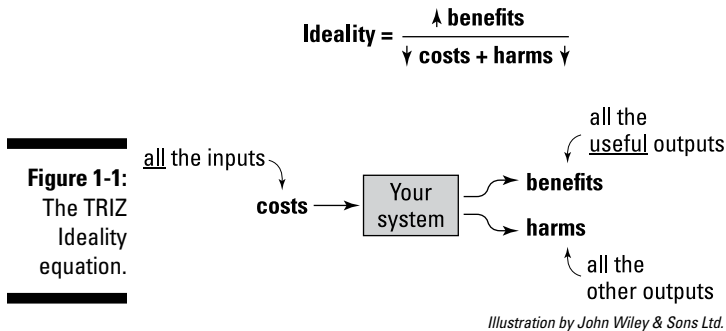
Increasing Ideality

The main goal of TRIZ is to increase Ideality. *Ideality* is the TRIZ equation for working out how good something is, as shown in Figure 1-1.



The Ideality of a system is the ratio of its benefits compared to its costs and harms:

- ✓ **Benefits** are all the outputs that you want, expressed as outcomes (not solutions).
- ✓ **Costs** are all the inputs required to create a system (not just money but also time, materials, cleverness and so on).
- ✓ **Harms** are all the outputs from your system that you don't want (even neutral things that aren't actively harmful).



A *system* in TRIZ is a very general term: it means any kind of product or process that's created and used to meet a need.

Ideality is important because it's very simple, and very brutal. It holds in the front of your mind the reason you're doing whatever it is you're doing. The benefits are the outcomes that you want but no mention is made of how you get those benefits. That's deliberate because it keeps your focus on the outcomes you want and not on exactly how you'll achieve them. This approach stops you becoming enraptured with solutions too soon, and always reminds you that other ways of getting what you want may exist. When you think about benefits, you consider all the things you want and not merely the outcomes you believe are achievable. This drives you continually to find new benefits you can deliver, and ways to increase the levels of benefits you're currently achieving.

You're also aware of *all* the downsides associated with the various ways of getting what you want. This is important because it forces you to look for problems, which means in turn that you'll be able to solve the problems and improve your system continually, in an iterative way.



Ideality identifies two kinds of problems:

- ✓ Costs (all inputs)
- ✓ Harms (all outputs you don't want)

TRIZ is always looking for ways to reduce *costs*; not just money but also time, parts, materials, effort – any kind of input required to create your system, in fact. TRIZ thinking pushes you towards creating simple, elegant systems and solutions to problems, which often involves finding innovative ways of getting what you want. While many traditional approaches also consider both costs and benefits (or sometimes functions), thinking about harms provides additional power.

Harms are all outputs you don't want – they needn't be actively harmful but are things produced by your system that aren't useful to you. Examples include things that may seem 'neutral' initially, such as heat from a laptop or noise from a washing machine, any complicated features you don't use on a smartphone, and waste or even potential risk. Thinking about harms encourages a more holistic view of your system, in which you consider its impact in the bigger picture. It also drives you towards simpler, more efficient systems, because all harms are things you're fundamentally paying for in some way: heat from a lightbulb may not be actively harmful but it is wasted energy, and finding a way to reduce that heat output will result in either more light (increased benefit) or reduced energy use (reduced cost).

All TRIZ tools exist to improve Ideality. They increase benefits, reduce costs or reduce harms – or all three! Ideality is referred to throughout this book because, while you can use it as a standalone tool (see Chapters 5 and 9 for details), it's also more of a fundamental way of understanding TRIZ and its purpose.

Ideality expresses in a nutshell the duality of TRIZ. On the one hand, you have one eye on utopia and all the benefits you want (even though you know you probably won't get them). On the other hand, you're searching for all the problems that exist in your real-world system (so you can get rid of them). TRIZ helps you connect fantasy and reality: you allow yourself to imagine perfection *and* engage with the nitty-gritty of practical systems. Obviously, this behaviour is a contradiction; however, TRIZ says the world is full of contradictions and you shouldn't be afraid of them, ignore them in the hope that they'll go away or compromise too soon in an attempt to resolve them. Ideality is a concept that balances the good and bad in any kind of system, and holds them together at the same time. Understanding and appreciating the conflict between the good and the bad allows you to work in an ambiguous, creative and potentially very fruitful space.

Uncovering patterns in human creativity

The logic underpinning TRIZ is that patterns exist across problems and the solutions that have previously been found to those problems. If you can understand how your situation is similar to previous situations, you can short-circuit the problem-solving process and generate very creative solutions.

TRIZ was observed, not invented. The earliest research found that the same problems occur again and again across different industries, and that very similar solutions are found to these problems (Chapter 2 gives you the low-down on how TRIZ was developed).



For any problem you encounter, chances are that someone else will have seen something similar in the past – and found a solution. Even more excitingly, the solutions people come up with also exhibit similarities. What the TRIZ community has captured are the patterns that exist in both the kinds of problems that people address and the way in which they solve them. These patterns have been encapsulated in a series of thinking tools that the rest of us can apply to solve our problems.

Learning to think in the abstract

All TRIZ problem-solving tools help you move between thinking about very specific, real-world problems and considering more general, conceptual ways of looking at those problems.

You can view this process as a journey whereby, rather than attempting to go from where you are now directly to where you want to get to, you take a step out of reality into an abstract world. You then understand your problem in a more conceptual way and can create a generalised ‘model’ of it that identifies its true nature. When you’ve done this, you can look for abstract, generalised solutions to your problem, and then work out how to turn these abstract solutions into real, practical solutions. Lots of creativity tools exist to help you model conceptual solutions, but TRIZ is unique in providing lists of conceptual solutions based on previous successful innovations that you can apply at this point to find the right solutions to your problem (see the nearby sidebar, ‘The four solution tools: Listy loveliness or 100 answers to everything’). After you’ve modelled your problem in a conceptual way, you’re directed to a small number of conceptual solutions that will be useful for that type of problem. This process may seem a bit long-winded, but I promise it isn’t! The time you spend grappling with your problem and modelling it in a conceptual way aids your clarity of thought and understanding and ensures the real problem is explicit. Looking up the solutions is easy, and only takes a few minutes. The time spent generating solutions is then enormous fun: you’re being creative and thinking of answers to your hardest questions and problems but are also focusing all that brainpower and creativity in the most useful places – where you’re most likely to find inventive and creative solutions.



A number of TRIZ tools help you take a specific problem and create a conceptual model of it. When you’ve created that model, you can then look up how people have solved this kind of problem in the past. A number of ways of solving this problem that other people have used successfully in the past will exist. You can then take these situations and reapply them to your situation.

Part of the power of TRIZ thinking and the TRIZ tools comes from this moving between the real world and the conceptual, more abstract world. This process is called using the *Prism of TRIZ*, as shown in Figure 1-2.

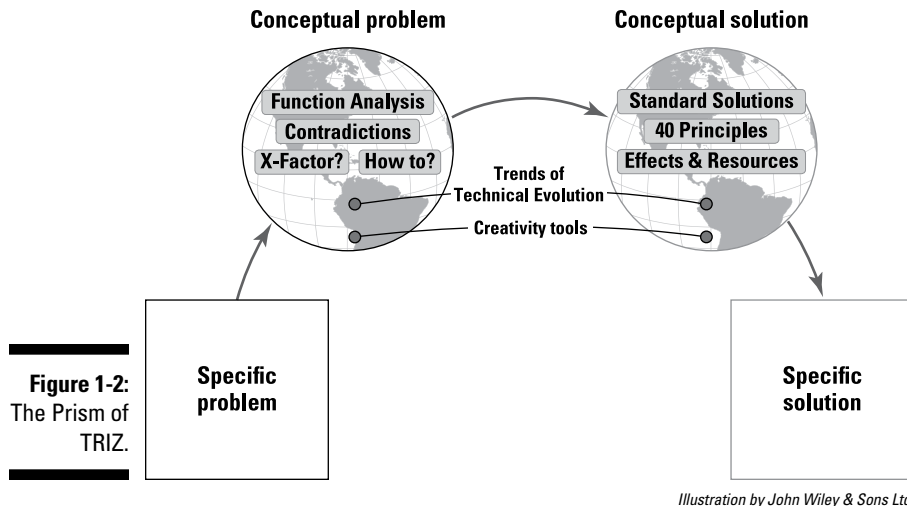


Figure 1-2:
The Prism of
TRIZ.

Illustration by John Wiley & Sons Ltd.

The four solution tools: Listy loveliness or 100 answers to everything

The completely unique aspect of TRIZ is the lists of solutions derived from patent databases: the 40 Inventive Principles, the 8 Trends of Technical Evolution, the 76 Standard Solutions and the Effects Database. These lists comprise the most clever and inventive solutions discovered in patents and scientific journals. Specific solutions to specific problems were distilled into the essence of what made them clever; solutions such as vibrate something, make it more flexible, insulate from something harmful. As well as generalising the solutions found in patents, the TRIZ community also described the problems it was solving in a conceptual rather than technical or scientific way, such as 'something gets better and something else gets worse' (a Technical Contradiction) or 'this is useful but not quite good enough' (an Insufficient Useful Action). A huge amount of work was then carried out cross-referencing the kinds of problems that re-occurred and the solutions that were most commonly used to solve them.

When you have a specific problem, you first convert it to a general problem. You then look up the general solutions to your problem in one of the four solution tool lists. You're directed to just a handful of conceptual solutions to your problem, which you have to convert into something real, practical and tangible in your specific situation – stepping through the Prism of TRIZ (see Figure 1-2). If finding solutions is like digging for buried treasure, TRIZ supplies the map. It shows you where to dig first: the places in which you're most likely to find the most clever solutions.

The TRIZ lists contain approximately 100 solutions. The mathematically minded among you will notice that this figure is less than the number you'd get if you added up all the solutions in the lists above – and that's because the lists of tools overlap. As a result, you don't need to use all the tools when looking for solutions: applying two or three will give you good coverage of the solution space.

Connecting conceptual thinking with your knowledge and experience

Using your experience and knowledge is a critical element of TRIZ. It's not just a question of taking someone else's solution and applying it directly; rather, you're given a conceptual prompt or trigger.

You then have to activate all your domain knowledge and experience of the problem and the situation in order to turn that conceptual solution into something real. The conceptual solutions need to connect with your practical expertise in order to become useful. As a result, TRIZ makes the best use of your experience – it is not a substitute for it.

The TRIZ problem-solving process utilises your knowledge, practical experience and expertise to the best of their ability. The TRIZ solution tools focus and enhance your experience, so that you use your knowledge in new and inventive ways. If you have no knowledge or experience in a particular area, you won't be able to solve problems in that area with TRIZ because you don't know how things work.



Here's something to bear in mind, as it applies to you as well as me: for all my TRIZ superpowers, I can't solve my clients' problems for them, as I don't have their domain knowledge. I can only help them understand and define their problems with TRIZ and look up the suggested solutions. That last step in the Prism of TRIZ – the leap from conceptual to practical solutions – is completely up to them. TRIZ stimulates their creativity and, as a result, they're able to generate insight, new thinking and many innovative solutions.

What's so heartening about this is that because TRIZ shows you how to apply your knowledge in new ways, you'll make better use of TRIZ and become a better problem solver as your career progresses. When you develop very deep expertise in an area, it can become like a narrow pit in which your thinking is stuck: you know solutions to many, many problems and you can think of them easily. So easily, in fact, that thinking of anything new is difficult. TRIZ helps you generate those solutions based on your experience, and then move beyond them to apply your expertise in novel ways. For those of us who aren't getting any younger (which, let's face it, is all of us), this is good news. It means that, once you've learned TRIZ, as your experience and expertise grow so will your creativity and problem-solving ability.

TRIZ enhances and develops expertise

While TRIZ can't replace expertise, it may well help it develop. One interesting observation from TRIZ workshops is that when teams of different people are working on a problem, those who have experience in the same field but without deep knowledge of the problem or particular area will often generate solutions that are both highly innovative and highly practical. When you're looking for solutions to a problem, therefore, don't just involve the

experts. Instead, also involve people who have general domain knowledge in your area, even if they don't have specific knowledge of the problem at hand. TRIZ will help them generate useful solutions. This also suggests that if you're just starting out in your career, TRIZ will help you generate the same kind of solutions as experts in your field. You'll also have the benefit of developing flexibility of thinking as you gain expertise in your area.

Going beyond your own experience

One of the interesting things about different disciplines is that they often take different approaches to identifying problems and coming up with new ideas. If you put a teacher, a doctor, an engineer, a physicist, a mathematician and a philosopher together to solve a problem, they'll all have very different ideas about how best to examine it and find solutions (many jokes are based on this premise, and you can find one at the end of Chapter 2!). Your profession influences how you look at problems and the kind of solutions you generate.



If you want to improve the behaviour of a naughty child, how you characterise the problem and generate solutions depends on your perspective. Consider the perspectives of a parent (who needs to get everyone to school on time *and* teach the child patterns of behaviour for the longterm), a teacher (who may need to manage a whole classroom *and* get children to learn), a child psychologist (who may focus on the underlying causes of the naughty behaviour) and an anthropologist (who may be interested in how children and parents interact and communicate and what this says about the local culture). None of these approaches is wrong. Each has something good about it and will bring a different perspective to the problem that's new and interesting. However, everyone thinks their approach is 'the right one', and will tackle problems according to the kind of solutions they're familiar with (as the nearby sidebar, 'Tackling the glass of water problem', suggests, when you have a hammer, everything can look like a nail).