Some personal thoughts on contradictions

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In this short article I have given my personal views of contradictions based on three years of using TRIZ. Hopefully it will generate some comments.

There is only one Contradiction

One of the confusing issues I found when learning TRIZ was the two types of contradiction physical and technical – particularly when every text stated that the names didn't really mean anything. I found that the only way I could remember the differences was by their initials : Technical Contradiction **TC** was a **T**rade off **C**ompromise and that a Physical Contradiction **PC** was a **P**ure **C**ontradiction. Fortunately I was not put off, but how many people are because of the need to seemingly learn a new language?
The learning of TRIZ would be made much simpler if we renamed both terms.

It is my belief that the technical contradiction should not be considered to be a contradiction at all. Let us consider the relationship between weight and strength of a table. We would want a stronger table and **never** want a weaker table. There is no contradiction here. We only want to increase the strength of the table. Similarly unless taken to its extreme we would always want a lighter table – again no contradiction. The "contradiction" only appears when we look at the relationship between weight and strength. The fact that, all else being equal, as strength increases (good) weight increases (bad). The contradiction appears but in the form of good and bad. How much less confusing if we termed this not a contradiction but a conflict, a compromise or perhaps to be consistent with "Simplified TRIZ" by Ellen Domb and Kalevi Rantanen a Trade Off. We want a stronger table but have to compromise by increasing its weight unless we apply the 40 principles. We would therefore talk in terms of looking for and being aware of Trade Offs and looking at how to resolve them using the 40 principles to avoid compromise. The contradiction matrix would then become the Trade Off matrix.

It is quite clear to me that the Physical Contradiction **is** a contradiction – we wish an object to be hot and we wish an object to be cold are clearly contradictory statements. So why not refer to it simply as a contradiction? This goes a step further than the Inherent Contradiction used by Domb and Rantanen I can hear people saying this would be very confusing. Confusing for TRIZ practioners yes! But the key importance is not to confuse newcomers to the subject.

The Matrix Friend or Foe?

I have four laws of the matrix.
1. Whatever I want to improve is rarely one of the 39 factors.
2. Whatever worsens is rarely one of the 39 factors either.
3. When I do find a match for both factors, the indicated 4 principles do not yield a solution.
4. The only good thing about the matrix is that instead of looking at 40 principles one looks at 4.

Although clearly provocative statements, I do feel that the matrix should not be taken too seriously.

The fact that the factor one wishes to improve is not on the list is not necessarily a bad thing. It makes one think more more deeply about what one is trying to improve and how it relates to the 39 factors. It helps to overcome one's mental blocks and to look at the problem in other ways.

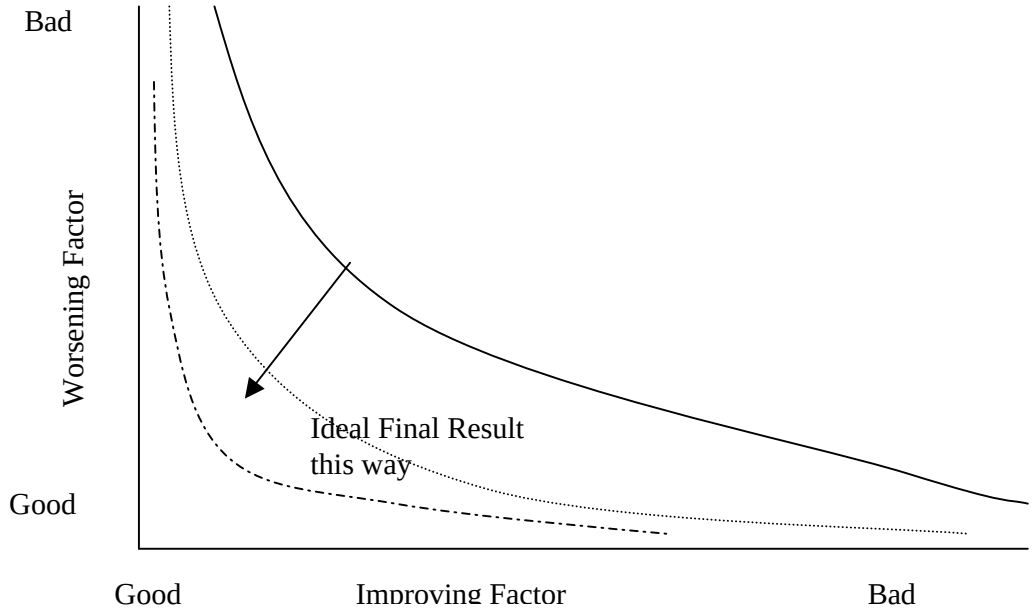
I feel that the main use the matrix fulfills is one of giving a picture of what trade offs are and that once one finds there is a trade off, that one of the 40 principles will solve the problem.

So I would say use the matrix with caution. Quickly look for factors to improve and which factors worsen. An excellent way of looking at the matrix (thanks Darrell) is to consider the worsening factor as something that is stopping you making the improvement. I want to improve factor Y but factor X is stopping me. If none of the 4 principles seems to apply try again but don't agonise over it. Better after say 10 minutes of trying to use the matrix, quickly look through all the principles. There are several benefits to this approach:
In doing this on a regular basis one is reminded of some of the less used principles that might not apply on the problem in question but might be of use on some completely unrelated issue.

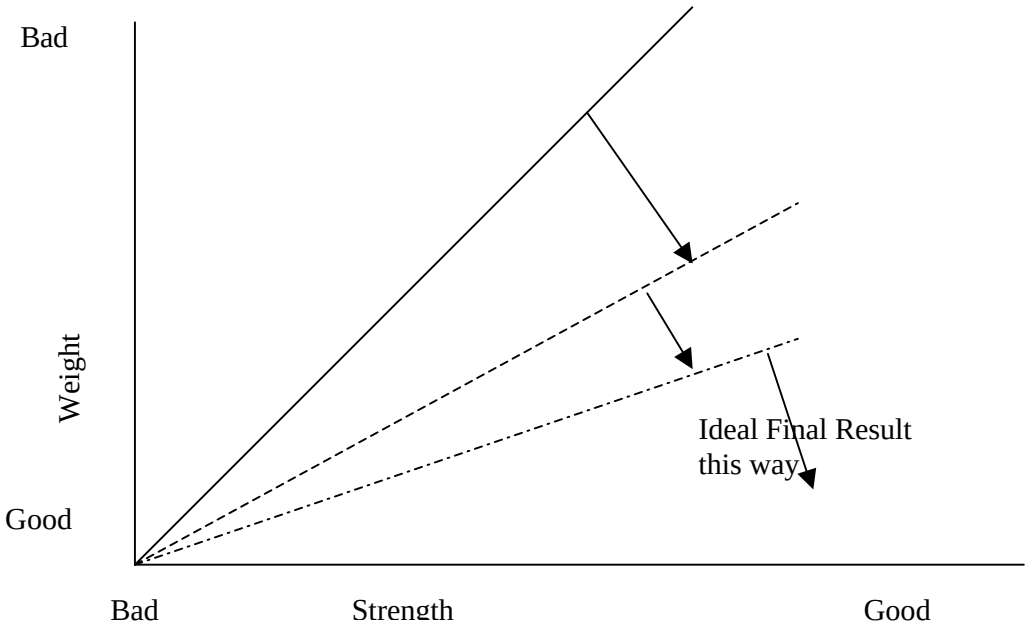
More importantly the solution to the problem might be a combination of two or even more of the principles. One problem I was working on recently yielded excellent results when going around the list for the second time. The combination of two principles yielded a very simple, powerful solution. I am sure that if I had slavishly stuck to the matrix I would not have acheived this result. (See Case study below)

Finally it is important to realise that TRIZ does not eliminate the need for thinking. It will never be the case that the solution appears with next to no effort. What TRIZ does, is make sure one is pointed in the correct direction. However one still needs to convert the generic solution into one's own specific solution. And the more that one is forced to think things through, the better one becomes at finding the solutions.

Trade Off Graphs



Some authors tend to be show Trade Offs as above, yet many times if one looks at the pair of factors they are better plotted as below (taking the relationship between weight and strength as an example)



I feel plotted this way then the conflict can be understood much better. We have a direct relationship between weight and strength and we wish to get more strength without more weight. In graphical terms we wish to reduce the gradient of the curve with the Ideal Final Result running along the X axis. If we apply one of the 40 principles a new curve can be plotted – using composite materials (say). The next curve might be composite materials with hollow sections etc. And curves after that??

So Trade Offs can be seen as trying to improve the efficiency of what one is doing, of getting more of the good stuff with less of the bad stuff.

I look forward to receiving comments about this article.

Case Study

Our objective was to improve the performance of a filter. The filter blocked very quickly, causing excessive maintenance costs. We felt that there were resources being under utilised in the existing filter – particularly the energy energy (and hence cleaning power) in the fluid being filtered. To better utilise the power in the fluid flow we started working through the forty principles. As we worked our way through we found many of the principles might be utilised and principle 14 – Curvature was one we toyed with. However, in going through the list for the second time principle 8 – Antiweight leapt out at us. First time round we had skipped past it, not seeing how it might apply. But as soon as we combined 8 and 14 -We could use floating balls to keep the filter clean. The energy in the flow would constantly agitate the balls and the buoyancy forces would mean that

the balls would keep bobbing back up to the downstream filter face – a self cleaning filter!

About the Author

Brian is a physics graduate who spent 23 years in research and development within the glass industry. He came across TRIZ 3 years ago. He has attended several courses run by Oxford Creativity and CREAX and has read widely on the subject. He has used TRIZ to solve many real problems and is particularly keen to see TRIZ more widely adopted in the UK. He is the moderator of TRIZ UK an e'mail based discussion group. TRIZUK-subscribe@yahoogroups.co.uk