**How to discover trade-offs**

**and find their resolution**

**The papers provided with this Workshop have been selected for easy analysis (really!)**

**Analysing a research paper to define the trade-off**

The Abstract and Introduction are the places to look for the topic of the trade-off. Simply search for the word ‘trade-off’ then see what the two halves of the trade-off are. This may not always work, since the trade-off can be defined in other ways as explained in the next section. There is no need to analyse the topic areas of each of the two Trade-Off Parameters (TOPs) further than this, unless you are building a data base of trade-offs. If the latter, then it helps if you use the table of TOPs provided with this Workshop package. The package includes a spreadsheet with the TOPs listed in the order in which they appear in the TRIZ Contradiction Matrix that forms the basic model for this approach to the definition and cataloguing of problems. Each TOP is expanded with words that you might find in a research paper to help you identify the correct TOP. There are also two sets of sheets showing tree diagrams of the TOPs and the Inventive Principles (IPs) which show the structure in a more visual way.

**Recognising a trade-off**

Most times a trade-off is identified within the paper, but many times it isn’t. If the paper concerns a solution to a problem, or a balance between effects, then there is a trade-off but it may be more difficult to define. All the papers supplied for this Workshop have a trade-off at their centre, but it’s not always obvious. A simple technique for finding trade-offs and their resolution is discussed in “How to discover trade-offs and find their resolution”;

In the following, the two halves of the trade-off are shown as [A] and [B]. They can be things, activities, effects or functions, solo or systems.

The simplest is “ . . . a trade-off between [A] and [B] . . . “ e.g. paper by Abrams

Another simple one is “[A]-[B] trade-off” e.g. paper by Bennett et.al.

A bit more complex “trade-off . . . juggle [A] and [B]” e.g. Brierly & Cox

The same expressed differently “balance [A] with [B]” e.g. Dammhahn & Almeling

A negative relation can also be a trade-off, as in “[A] resulted in slower [B]” e.g. Chou et.al

Another negative relation is expressed as “[A] versus [B]” e.g. Currey . . . .

Or again, “[A] counteracting [B]” e.g. de Blasio . . .

Or again “[A] is insufficient to [B] (but it does)” e.g. Eylers . . .

Or again “effect [A] feeds-forwards to affect [B]” e.g. Greene

More subtle, implicit trade-off as “Reduction in [A] implies autonomy of [B]” e.g. Coombes

And similarly a negative feedback effect may involve a trade-off e.g. Gopfert & Robert

**Finding the resolution of the trade-off**

The focus of the search will be the Discussion, or in some cases the Results and Discussion, section of the paper. The first action is to identify each time the word “trade-off”, or similar expression appears. It’s quite likely that the two defining parameters of the trade-off will also be mentioned close by, occasionally with different words for the TOPs. The same area of the paper – i.e. the next sentence or two – may well give you one or more of the factors involved in the resolution. The words used to define the trade-off will associate with words and ideas that are involved in the resolution of the trade-off. To some extent this requires some knowledge of the subject matter of the paper, but this is less a requirement than you might think. You are looking for relationships rather than knowledge.

Do not be discouraged if you can’t find any suggestions of a resolution. About half the papers on trade-offs do not identify the resolution, or even attempt it.

**Finding trade-offs in the wider literature**

Once you have tried out the exercises in this workshop you might like to develop some of the ideas yourself. You might be interested in the techniques involved in analysing a trade-off, or you might have a problem that could be solved using this approach. Although computer methods are available to search and analyse papers for trade-offs and their resolution, it is good to go through the process by hand so you know what you are doing. This way you are far less likely to make mistakes.

It’s easy to identify trade-off publications, though the method below s not as thorough and complete as the computer can be with the currently developed software.

Access the website of a publisher of research journals and search through the papers to find the word ‘trade-off’, or “tradeoff”. These are not only the easiest trade-off articles to find but they are the easiest to analyse.