Perceptions And Intangibles
TRIZ and 'People' Problems

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"It's the whole thing, stupid."
Complex Systems Theory response to 'Keep It Simple, Stupid' aphorism

Abstract

The paper discusses the application of TRIZ to problems involving the complexities that inevitably emerge when human personality issues are present. The paper is divided into two interleaved parts; the first part discusses the capability of TRIZ to successfully manage complex 'people' problems relative to other tools and strategies developed outside of TRIZ. The second part then describes a case study example aimed at demonstrating the outputs that can be achieved when TRIZ concepts and ideas are integrated into a more holistic methodology. The case study example is based on the issue of motivation of people.

Introduction

Despite the words of several in the community that TRIZ can be applied to problem situations involving people, extensive experience of applying classical TRIZ in such non-technical situations suggests that it is a rather blunt instrument. People problems involve intangible issues like knowledge, communications, social convention, friendship, pride and prestige. They also involve an order of magnitude increase in complexity relative to technical problems thanks to the presence and frequent dominance of perception over reality. The fact that different people can have very different perspectives on a situation, and the further fact that none may have a correct interpretation, necessitates the use of carefully conceived strategies for managing the complexities and generating successful solutions.

Any desire to create a problem-solving philosophy and methodology that can literally be applied to any type of situation means that these perception and intangibles issues cannot be ignored. Based on a now comprehensive database of problem solving situations dating back to the mid 1990s, we now believe that the high level concepts and ideas within TRIZ are a necessary but not sufficient set when it comes to solving 'people' problems. The five philosophical pillars described in Reference 1 are seen as absolutely relevant and applicable in non-technical as well as technical situations. These pillars comprise:

- the importance of **function** and functionality
- evolution of systems towards an **Ideal** Final Result end state that is ultimately determined by the customer
- the successive emergence and resolution of conflicts and **contradictions** as the principle mechanism of evolution
- the maximal use of existing **resources**, and
- the ability to think in terms of space, time and interface (the manner in which different 'things' relate to other 'things')

When it comes to problems carrying any kind of non-technical element, however, these five are often no longer enough to present robustly deployable solutions. Hence in Reference 2 – the business analogue of Reference 1 – we see this list expanded to include the high level concepts and ideas derived through best practices evolved beyond the scope of the classical TRIZ research. Thus, specifically relevant to the intent to successfully manage 'people' problems, it is necessary to recognise the inherent relevance of:-

- complex systems theory – and the belief that highly complex systems **emerge** from the application of relatively small numbers of simple rules,
- cybernetics – and recognition of the importance that **recursion** has in the emergence of viable systems

While undoubtedly still an incomplete set in terms of what will eventually emerge as a truly unifying collection, it is hypothesised that the integration of the 5 TRIZ pillars plus these two concepts (Figure 1) presents the opportunity to successfully tackle 'people' problems in at least the business and organisational context.

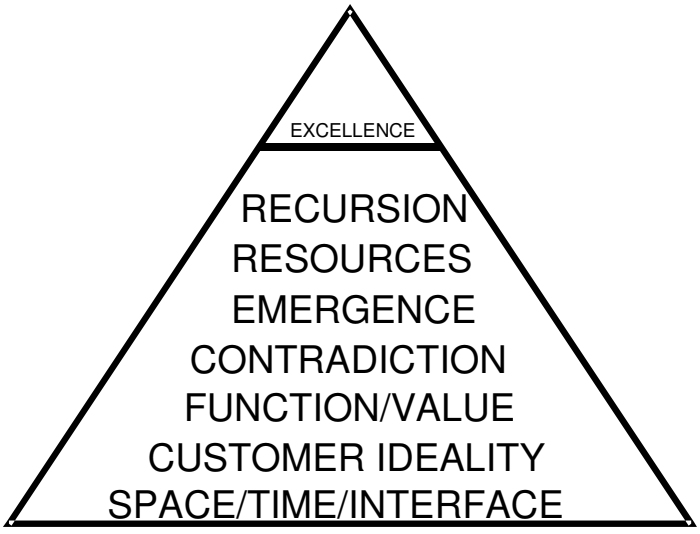


Figure 1: Seven Philosophical Tenets of a Holistic Problem Solving Approach

In the following sections of the paper we discuss the impact that the inclusion of complexity and recursion concepts might have on the way that TRIZ would approach 'people problems'. Since the whole idea of 'people problems' is so very general, most of the emphasis here will be placed on the definition parts of the problem-solving process. This approach is adopted on the basis that a) defining the problem is often much more difficult than solving it once we have the 'right' definition, and b) by focusing on the generic rather than the specific, we open up the possibility that the general techniques presented can be applied in any number of specific

situations that might be experienced by the reader. In order to give at least some focus to the effort, the subject of 'motivation' problems is used as a foundation.

Motivation Problems

Judging by the sorts of problems that managers bring to our systematic innovation workshops, problems of motivation – whether it be of staff, workers, peers, students or whoever – appear to be everywhere. Tackling what is obviously a very big and complex issue requires strategies with somewhat more substance than can be found in sayings like 'a manager cannot motivate people; he/she can only de-motivate them'. This is not to say that these kind of statements are either incorrect or invalid; simply that they are insufficient to allow us to actually *do* anything.

To do something about the generalised motivation problem, according to the problem definition steps recommended in Reference 2, requires five distinct activities:-

1) completion of a 'problem explorer' questionnaire – a series of questions aimed at eliciting information on where we are trying to get to, how we know when we have successfully got there, what resources we have available and what constraints we have to work within. (Electronic versions of this 'explorer' can be downloaded at Reference 3.)
2) definition of the 'Ideal Final Result' outcome and identification of the solution directions on the route between the current situation and that Ideal Final Result.
3) assessment of the maturity of the current system
4) construction of a function analysis map of the problem situation
5) construction of a perception map of the problem situation

We will focus here on the last two of these five elements. Before we do that, however, it is useful to think a little more about the Ideal Final Result definition part of the process. In simplest terms here, we may use the IFR concept to derive a statement something along the lines of 'the people motivate themselves' as our ideal solution. This would be consistent with the earlier idea that people cannot be externally motivated, and would also quickly lead us on to the important follow-on question, 'what is stopping us from reaching this IFR outcome?' Why, in other words, don't people motivate themselves?

The next two parts of the problem definition process can hopefully help us to identify answers to this type of question.

Modelling Intangibles

The function analysis tool first developed by Larry Miles in the 60s has been integrated and expanded within TRIZ (Reference 4). Probably the biggest conceptual advance in function analysis made by TRIZ has been the incorporation of questions aimed at identifying the negative functions present within systems. The questions

- what are the harmful functions?
- what are the functions that there are too much of?
- what are the functions that there is not enough of?
- what are the functions that are missing?

provide a solid platform from which we can define what it is that can be done to improve a system. The fact that the process forces users to examine the elements within a system pair-

by-pair ('what harmful functions exist between A and B?' for example) is central to the ability of the tool to manage the complexities present within systems.

For problem situations involving 'people' issues – like our motivation problem – the only change to the conventional function analysis process is that we add stages to explicitly examine the intangible relationships between pairs of elements contained within the system. Intangibles can be defined as "non-physical factors that contribute to or are used in producing goods or providing services, or that are expected to generate future productive benefits for the individuals or firms that control the use of those factors" (Brookings Institute definition from Reference 5), and may be seen as a wide range of different elements. A list of types of intangibles is likely to include some or all of the following; knowledge, skills, experience, alliances, relationships, brand recognition, processes. As is the preferred convention for the function analysis process, it is important to consider both the positive and negative intangibles. Taken together, the recommended function analysis model construction process when there are intangible issues present is thus as follows:-

1) Identify Components in System

2) Define USEFUL functional relationships

3) Define intangible USEFUL functional relationships

4) Define NEGATIVE functional relationships
(Harmful, Insufficient, Excessive, Missing)

5) Define intangible NEGATIVE functional relationships

Experience of using this process firmly indicates that the separation of tangible from intangible and (even more so) the positive from the negative can be crucial since each aspect is using physiologically different parts of the brain.

Translated into an actual model for a typical motivation problem situation this process will result in the sort of function analysis model drawn in Figure 2. This model describes a generic situation involving a simple customer-supplier-manager relationship.

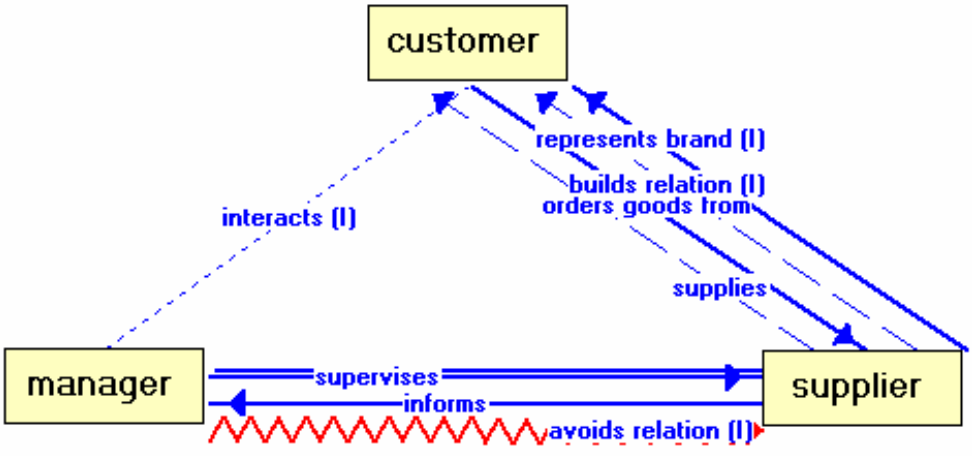


Figure 2: Typical Function Analysis Model When 'Intangibles' Are Included
(Intangibles labelled with an '(I)')

At this point in time there is no fixed convention that determines what type of line describes different types of functional relationships. We have thus far chosen to maintain the classical TRIZ conventions for useful, excessive, insufficient and harmful relationships. The discrimination between tangibles and intangibles is hindered in this paper by the limitations of black and white printing and so the label 'I' has been used to identify those relationships associated with intangibles. In the CREAX software, we have simply allowed the user to re-colour and re-format lines according to whatever convention suits any given set of circumstances.

As can be seen from the figure, an apparently simple three-component system can rapidly produce a system of relationships that is highly complex. It is our belief that only this kind of systematic function analysis process permits accurate descriptions of the real world to be constructed. Once we have constructed this picture, a significant amount of 'complexity management' has been performed; hopefully at least enough to permit a successful transition into the downstream – solution generation – parts of the TRIZ process (Reference 2). Since each specific problem situation is going to give rise to a different function analysis model, we will say no more about this one except to point out the importance of self-re-enforcing loops that might be present. As discussed in Reference 6 (and in more detail in Reference 2), such relationship loops – whether positive or negative – can have a profound impact on our ability to solve problems effectively. As we shall see in the next section the destruction of self-re-enforcing negative loops and/or the creation or strengthening of positive loops represent important, self-sustaining solution directions. In terms of the exemplar motivation problem we might look to the excessive supervision and harmful 'avoids relationship with' relationships between manager and supplier as elements that might be contributing to motivation problems experienced by the supplier. The combination of relationship types present in the function analysis model will determine which of the TRIZ solution generation tools will best help to solve the problems defined.

Mapping Perceptions

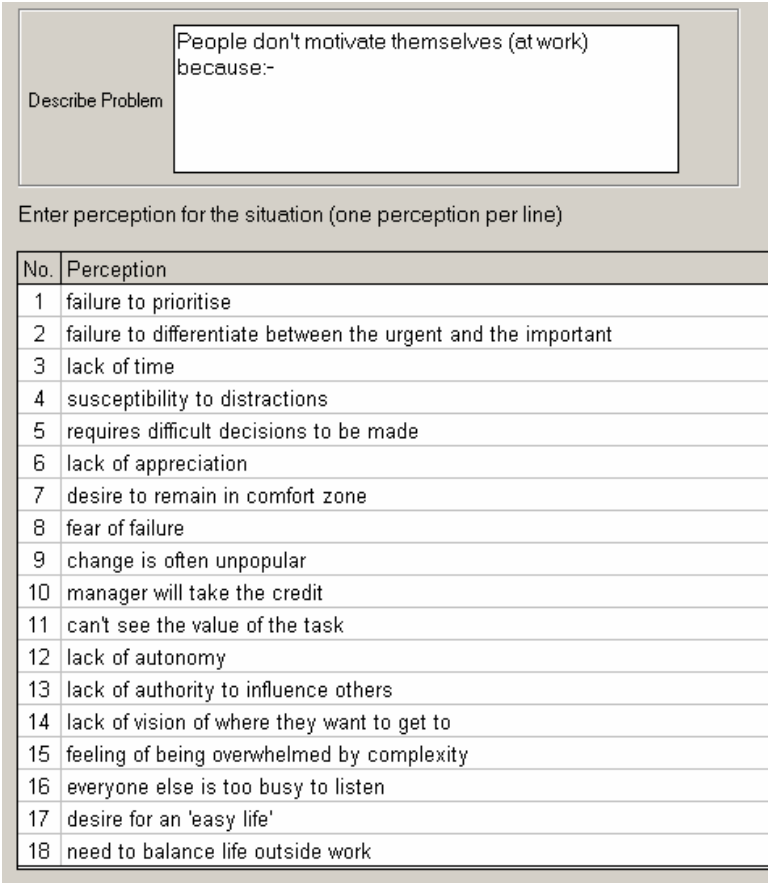
Everyone sees problems differently to everyone else. This is because we all bring our own unique background and perspectives to a situation. Whether these perspectives are factually correct, or merely our perceptions of fact, they need to be dealt with appropriately during the problem solving process. Perception mapping is a tool facilitating the definition and management of the complexities inherent to processes involving different people with different perspectives of a problem. It is a process aimed at making sense of situations that may otherwise be charged with conflicting emotions and the various foibles of the human mind – most notably in our experience, a reluctance to divulge perceptions that might make us unpopular with others, even though those perception may be extremely deeply held. The mechanics of the perception mapping process have previously been described elsewhere (Reference 2, 7) and so will not be repeated here. The overall perception mapping process has five basic stages:-

a) formulation of the focus question
b) creation of lists of perceptions
c) identification of what each of the perceptions 'leads to'
d) identification of conflicting perceptions, and
e) construction of the perception map

The first stage of the process involves the formulation of a good question against which to generate perceptions. 'Good' in this sense usually means configuring a question in a form that entries in the list of perceptions complete a sentence containing the question. Questions like

- 'Not everyone buys our product because…?'
- 'Quality problems would disappear if...?'
- 'The HR problem would be solved by…?'

thus make good start points. Based on the earlier IFR-derived idea that people should motivate themselves, we will use the question 'People don't motivate themselves because?' as the start point for a generalised perception mapping exercise on the motivation problem. Figure 3 lists the perceptions identified in response to this question. There are no absolute rules about how many perceptions should be generated by the process, but generally speaking it is advisable to use 10 as a minimum number (less than this and the perceptions can become so generic as to be useless from a complexity management perspective – for example answering our motivation problem question with a perception like 'because there are too many de-motivating factors' is of little value; far better to list each of the perceived de-motivators individually).



No.	Perception
1	failure to prioritise
2	failure to differentiate between the urgent and the important
3	lack of time
4	susceptibility to distractions
5	requires difficult decisions to be made
6	lack of appreciation
7	desire to remain in comfort zone
8	fear of failure
9	change is often unpopular
10	manager will take the credit
11	can't see the value of the task
12	lack of autonomy
13	lack of authority to influence others
14	lack of vision of where they want to get to
15	feeling of being overwhelmed by complexity
16	everyone else is too busy to listen
17	desire for an 'easy life'
18	need to balance life outside work

Figure 3: List Of Perceptions For Generalised 'Motivation' Problem

The next part of the process – asking which of the other perceptions any given one 'leads to' – is the single most important step of the process. The only absolute rule during this stage is that each perception *must lead to one and only one* of the other perceptions. So, for example, when we look at the 'susceptibility to distractions' perception and ask which of the others

does it lead to, we have chosen 'lack of time'. In perception mapping language this is then interpreted as 'if we stop being susceptible to distractions, then this will lead to improvement in the lack of time problem'. The overall process is self-correcting in many senses; so if we find that we are unable to find any kind of 'leads to' match for a perception, it means that our list of perceptions is missing something, and so we should find an answer to the 'what does this one lead to?' question (remembering of course, that if we add new perceptions part way through the process, we need to re-commence the 'leads-to' analysis from scratch). The result of the 'one perception leads to one and only one other' rule is that when it comes to drawing the perception map, there must by definition be at least one self-re-enforcing loop of connecting perceptions. According to the process, these loops should act as the focus for subsequent problem solving activities. Strictly speaking, 'collector points' (perceptions which a lot of other perceptions lead *to*) and 'conflict connectors (perceptions that form a chain connecting perceptions that are in conflict with one another) will also turn out to be significant. Thus, from a potentially long list of perceptions, those perceptions that are present as loops, collectors or conflict connectors will be more important than other perceptions. The perception mapping process will have managed the complexities associated with which perceptions are more important than others.

Figure 4 illustrates the resulting perception map for the motivation problem perceptions listed in Figure 3.

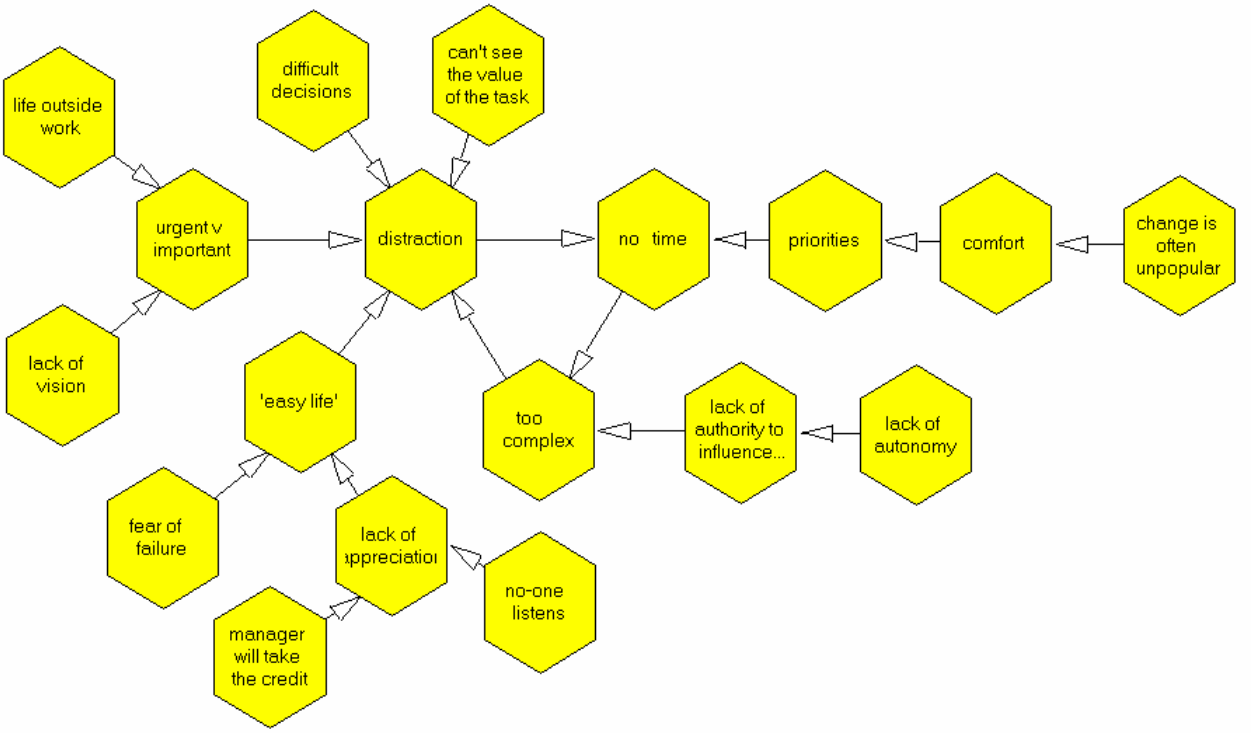


Figure 4: Perception Map For Generalised 'Motivation' Problem
(picture from CREAX Innovation Suite software – Reference 8)

The perception map indicates the presence of one self-re-enforcing loop in which our susceptibility to distraction leads to a lack of time; the lack of time then leads to our feeling of being overwhelmed by complexity; which in turn leads back to our susceptibility to distractions. According to the technique, out of all of the listed perceptions, these are the ones that are the most important and thus the ones that we should focus our problem solving

activities on. Since the 'susceptibility to distraction' has also been identified as a strong collector for other perceptions (eight of the other perceptions lead directly or indirectly to this one according to the map), it would further suggest that this is the perception from the ones in the loop that is the most important one. We might thus formulate a new problem along the lines of 'how might we stop ourselves from being susceptible to distractions?'

Asking this type of question very often leads to definition of contradictions. In this case, for example, we might see a conflict between the desire to avoid susceptibility to distraction and (for example) the need to allow times when the brain can re-charge itself. As soon as we have identified these kinds of contradiction, of course, we open ourselves up to the use of the Inventive Principles as a means of generating no-compromise solutions – e.g. I can use Principle 1, Segmentation to deliberately create times of the day when I should focus on the important stuff, and other times when we might allow the brain to wander, or I can use Principle 5, Merging, to give me the idea of joining several requirements into one piece of work in order that that completing that one piece gives me several useful outputs.

An important thing to recognise as the perception mapping activity proceeds is that the process is seeking to make systematic sense of the complexities rather than filtering things out. This is particularly important when using the process in a group setting in which everyone would like to see their contribution being recognised. The perception map offers a means of inter-relating complex information in situations that may otherwise be highly emotionally charged.

Summary And Conclusions

Classical TRIZ was designed for technical problems rather than the complexities inherent to situations involving individual humans. It should come as no real surprise, therefore that, despite all of the basic philosophical tenets continuing to be relevant, it is frequently ineffective when used to tackle 'people' problems.

In this paper we have described additions to the TRIZ framework that permit incorporation of issues of intangibility and differences in perceptions attributable to different people. Both the perception mapping tool and the function analysis tool extended to include intangibles have been presented in a way that will allow readers to apply the processes to their own specific problem situations.

The paper has examined a generalised 'motivation' problem as a means of describing the perceptions and intangibles story. We have deliberately focused on the definition parts of the problem solving process in order to – hopefully – demonstrate that it is possible to unravel and manage the complexities in a wide range of other types of problem situation.

The world is an increasingly complex place. The large majority of 'real world' problems are significantly more complex than any one brain is able to (consciously) manage. Traditional approaches to the solution of complex problems have thus tended to involve strategies of filtration and simplification. Any complex problem has a simple solution if you filter out enough of the complexity. Unfortunately, in the very large majority of cases that simple solution turns out to be wrong. Reliable and robust solution of complex problems cannot be achieved by filtering out the difficult bits. 'Keep it simple' problem solving strategies tend to produce results that are ultimately stupid.

The aim of this paper has been to demonstrate at least the start of a means of addressing complex problems in a non-filtering, holistic and yet systematically reproducible and manageable fashion. We anticipate publishing more case studies and methodology enhancements in the coming months.

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