DETERMINING MOTIVATION AND STRATEGY WITH THE TRIZ CONTRADICTION MATRIX

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Overview

TRIZ has been used for decades to promote innovation across the spectrum of corporate and scientific interest. From (example) to (example), government, military, and private enterprises have used TRIZ to solve problems and enhance systematic creativity. Consider if a basic tool used by TRIZ could be implemented to understand and even forecast the technical and organizational innovations of others? The principles of strategic foresight mandate that any such opportunity must be seized. The universality and structured application of the TRIZ contradiction tables and principles in reverse offer just such a possibility.

Prominent TRIZ authors have cited the usefulness and ready embrace of contradiction table and 40 principles by TRIZ practitioners. Darrel Mann states that the contradiction matrix is “strangely magnetic” (p. 214) to early TRIZ practitioners. This should come as no surprise, for as Terninko, Zusman, and Zlotin write “there are contradictions in all we see and in every thought that we have, but we do not explore them.” (p. 70) Mann states that once one studies the inventive principles, “you will begin to see it everywhere, in business situations, in biology, etc.” (p. 215) Terninko, Zusman and Zlotin add that the “40 principles have a remarkably broad range of application.” (p. 71)

While further refinements of the contradiction table exist, the time-tested status of the matrix concept and the 40 inventive principles attest to the pioneering comprehensiveness of Altshuller’s work, in which over 400,000 patents were ultimately evaluated. Thus the principles and contradiction parameters are based on observed, recorded, and analyzed patterns of development and innovation. This face, together with their allure, suggest that the contradiction table and 40 principles serve as a pragmatic “good fit” for understanding the human creativity process in a systematic manner. Crucially, however, the contradiction-resolution use of the parameters to arrive at the principles can be reversed. Reversing the application of the contradiction-resolution table thereby allows us to investigate, anticipate, and –if-necessary- counter the emergent phenomena of development and innovation.

Methodology

The first step in our proposed methodology consists of observing, outlining, and delineating the emergent behavior or innovation at hand. While seemingly simple, this step involves great rigor, transparency and awareness regarding the client, team, and problem system at hand. The composition

and selection of each must be evaluated for comprehensiveness of knowledge, psychological inertia, and unwitting blind-spots. On one end of the spectrum, the task may be an individual effort carried out by an independent inventor or investigator who seeks to understand and pre-empt or co-opt the potential invention or behavior. At the other end, the work may be that of a team of analysts working for a large corporate entity, each with their own backgrounds and expertise. In either case, time demands must be weighed against the efficiency required to generate a valid picture of the problem or emergent innovation or behavior. The outgrowths and applications of systems theory or group learning and thinking techniques such as Edward de Bono's "Six Hats" method should prove invaluable in a group setting to generate a baseline consensus. For individuals, the use of alternative sources of information and the purposeful seeking-out of "disconfirming observations" (a social science term referring to data that challenges seemingly evident conceptual constructs) are required.

In the next step, the inventive principle at work in the emergent situation is decided upon. Overt information derived from the system owner, or concrete direction provided by the client, will no doubt save time, but should still be questioned in order to provide the best possible answer. In a hypothetical example, Fulan Industries may announce a forthcoming merger with Seneschal Satellite Services in a press release. A group of business analysts working for ACME Technology may be tasked by management with uncovering precisely what Fulan hopes to gain from the merger with Seneschal, and the opportunities and vulnerabilities the situation presents for ACME. In this case, the inventive principle of "merging" would be the evident principle in use.

Lacking such overt information or direction, or in a case where the most robust solution is desired, the group approach offers several secondary means of evaluating the principle at work. Expert opinion, both from within the group or from outside subject matter experts, may offer insights that can better delineate the appropriate direction for investigation. Debate, dialogue, and group learning and thinking methods such as those described earlier can also facilitate this important step. Given time constraints and the exhaustion or unavailability of the above techniques, the concurrence or non-concurrence of the analysts regarding the inventive principle at work may be recorded and used to generate material for the next step. This may range from a simple vote to the incorporation of more open methods such as freelisting. (see, for example, Thompson and Juan, 2006)

The final technique available in the absence of either a group setting or concrete information is the incorporation of the statistical frequency of principle use as evaluated by many TRIZ authors over the years. This technique may also be used to facilitate the type of work described above as well. Mann's 2004 listing of the TRIZ inventive principles by frequency of use in his "Comparing the Classical and New Contradiction Matrix" provides one source. Based on Mann's work, in the absence of other information or available techniques, one might decide that "local quality" (ranked second) is more likely to be the principle at work than "universality" (ranked twenty seventh). (2004)

The third step consists of determining the contradiction or contradictions the problem-system owner, group, or prospective invention is seeking to resolve. The techniques described above in the second step may –and ideally should- be utilized again. Helpful insights may be provided by examining the frequency count of improving and worsening parameters in the contradiction table itself. Terninko, Zusman, and

Zlotin have suggested the examination of the table in this regard in their work in the course of TRIZ problem solving and invention. Here, we again apply it in reverse, as we did in the example of Mann's frequency count. The crucial distinction to remember is that the frequency of use examination of the inventive principles in application rests upon empirical evidence, while here we draw upon the contradiction matrix itself. For this reason, it is all the more important that the frequency of contradiction parameters should be coupled with concrete examination of the situation at hand, expert opinion, background information, and so on.

In the example of merging, we see that parameter 25, "loss of time," occurs seven times— the most frequent of the improving parameters in contradictions resolved by merging. The worsening parameters are "weight of stationary object" (2), "length of stationary object" (4), "area of moving object" (5), "volume of moving object" (7), "force" (10), "stability of the object" (13), and "loss of energy" (22). In the hypothetical example given above, the business analysts for ACME may conclude that Fulan Industries is hoping to seize control of an emerging market in which Seneschal Satellite Systems operates.

If supported by other techniques and sources of information, it may be reasoned that Fulan Industries lacks the organizational mobility and expeditionary capacity (represented by "weight of moving object, length of stationary object, area of moving object" etc. as worsening parameters) to exploit this market in the necessary time frame without such a merger. With sufficient consensus and background research, the analysts could recommend to ACME that any disruption or further constraints on the merger process between Fulan and Seneschal could help deny this opening market to Fulan. Alternatively, the most frequent worsening parameter is 23, "loss of energy." The improving parameters in this case are "weight of moving object" (1), "weight of stationary object"(2), "force" (10), "shape" (12), "use of energy by moving object" (19), and "automation" (38). In this case, the merger between Fulan and Seneschal may represent an effort by Fulan to revive its viability in a competitive global market by harnessing the expansive energy of an upstart company such as Seneschal that will require minimal oversight cost and retro-fitting. Given this conclusion, the potential merger may be read as a sign of weakness on the part of Fulan as a global competitor, and the ACME analysts may recommend that their corporation ratchets up the pressure on their competition.

Two important observations must be made in summary of this methodological overview. First, such use of the inventive principles and contradiction table in reverse should not be viewed as a replacement for techniques such as the lines of evolution, the system operator, and so on, but rather an innovation that can complement and be complemented by them for a more robust and systematic approach to the analysis of innovation and emerging problem systems. Second, as stated above, the insights of practitioners and the schematic examination of the principles and matrix in particular must be weighed against concrete empirical innovation. In short, one of the best ways to understand the proposed methodology is as a tool to generate hypotheses –ideally, alternative competing hypotheses— that can be analyzed and evaluated in an effort to forecast and pre-empt emerging phenomena and developments of interest to the client.