Let's Make the Firework of Innovations

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I will tell of three cases. They show how you can solve problems with the tools of TRIZ both better and quicker than conventional way.

In the first case my wife solved a typical educational problem and implemented the solution in two hours.

The second example is a journalistic case from my own work. I generated the idea of an newspaper article, wrote the text and sold it in three weeks.

The third case is a continuation of the long story of the locking device, described in the November Issue of the TRIZ Journal [9], and in "Simplified TRIZ" [7].

Case 1: How the grandmother commanded without a command using a fairy tale

My wife walked with a grandchild on the village street. A boy, who was 3 years and 8 months old, rode a kid's bicycle.

She got tired. The situation contained a tradeoff. If she commands the child to stop and wait, she will feel herself comfortable, but the child will be unhappy. If she allows the boy ride fast, she herself will be unhappy.

Behind the tradeoff was hidden an inherent contradiction, very common in education: One should command, to get necessary things done. At the same time one should avoid commands and orders, to keep the child happy.

The ideal result would be: The boy himself stops and waits the grandma with pleasure, without any commands or pressure.

How to achieve the result? As an experienced educator she remembered that everything should be told via play. The play and the need to play are good resources. Here we can also see an example of the principle 7, nested doll. The educational content is wrapped to a fairy tale.

She also remembered another resource. They had just looked at a book of Indians.

She said : "Look. Here we are going on the buffalo path. From the house there will begin a new path. Let's stop there and check, which path it is."

The boy became immediately inspired by the play. They walked through the paths of the kangaroo, the elephant, the antelope, the tiger, and other exotic paths.

As usually good solutions, the idea ignited an extra effect. The kid began to invent paths himself. He picked up names from own experience: chicken's, cat's, dog's and beetle's path.

Case 2: How I wrote and sold an article of the Zero Vision to a newspaper

A nineteen-year-old student exploded October 11, 2002 a bomb in a shopping mall in a city near to Finnish capital Helsinki. He killed himself and six passers-by.

I have had plans to write for the general audience articles on some topics, including the concept of the ideal final result.

The preliminary work, "proaction" allowed me to react quickly. Here I applied the principle 10: preliminary action. This way I resolved the most common trade-off in journalism between speed and quality. If you want to write well, work will go slowly. If you increase speed, quality deteriorates.

The trade-off is caused by an inherent contradiction: much research - little research. Thorough research guarantees the high quality, but is time-consuming. Little research will require less time, but the quality will suffer.

I have had collected material many months, much research was already done.

I wrote an article, consisting of following points: The explosion does not mean, as many commentators said, that safety and security will inevitably be worse. Contrary, we should yet more persistently try to realize the zero vision or zero tolerance. The ultimate goal is to decrease to zero both crime, violence and accidents. The rise of the Six Sigma quality vision also indicates, that it is both necessary and possible to try to go to the zero. The model of the final ideal result, presented by Genrih Altshuller, combines different zero and quality visions to a single concept. A follower of Altshuller, Boris Zlotin, has developed an interesting way to increase ideality. People try to imagine, how to make things worse. Weak places are detected and can be removed. For example, attempt to imagine how to cause more accidents in cities in winter. The simulation reveals that building companies, maintenance organizations, health care and insurance companies, who all work optimally as isolated units, produce together low safety and big cost. Solutions to problems are often evident immediately when people see the real situation. The conclusion is: to make good, imagine first bad.

I used many innovative principles when I constructed the article. First, I connected the content to the bomb explosion, that was the news number one in Finland many days. I used actually the principle 18, that reads: Mechanical vibration. The traditional name is too narrow. It would be more precise to speak of "Rhythm and resonance principle". I tuned the article to the feelings of the public.

The connection with the explosion illustrates also the principle 8: weight compensation. Heavy content: zero vision, six sigma, ideality and failure anticipation, is "lifted" by typical "light" journalistic stuff: crime and violence. See other examples of "lifting" in "Simplified TRIZ", pp. 143-144.

The connection with emotionally charged topic also removes the threshold between the reader and subject matter. The principle 12: equipotentiality, is used.

Strong emotions are connected with cold facts. Principles 38 (strong oxidants) and 39 (inert atmosphere) work together.

The article, speaking of global concepts as zero vision, zero tolerance and ideality, has at the same time strong local quality (principle 4).

The important sales point was that the article presented the approach opposite to conventional thinking. To make things better is useful to imagine how to make things worse. He we have principle 13: the other way around.

I wrote an article during four days, simultaneously with other works, from October 11 to 15, and sent it to the biggest newspaper in Finland, Helsingin Sanomat ("Helsinki News"). The editor answered that they like it and can publish it, if I shorten the text to 4 000 marks (or 400 words). The first text was about 7 000 marks or 700 words.

I sat down to trim and streamline the article. Here we have a clear example of a pattern of evolution: expansion and convolution ("Simplified TRIZ", pp. 120-122). Streamlining refers also to the principle 14: curvature increase.

I got valuable feedback, except from the editor, from my wife and a friend. Here we have the principle 23: feedback.

The article was published November 1.

Only some examples of the use of principles are presented here. I have found that actually all of 40 principles can be used in journalism.

Case 3: A step forward on a long way to more safe ships

In the paper [9], in the patent description [5] and in "Simplified TRIZ" the new locking mechanism for gates and hatches have been described. The main point in the invention is that a cylindrical pin is replaced by the conical one.

Let's see how to improve the solution.

Modeling by nine screens ("Simplified TRIZ", pp. 43-44) gives nearly always new ideas. We can consider the locking mechanism with the conical pin as the present solution or system.

The locking mechanism is the part of the ship. The ship is the part of the large system consisting of the ship, the crew, the ship company, ship building companies, design organizations, insurance companies, maritime administration, and others.

Let's now make a quick look at the literature on big accidents earlier: Challenger 1986, Chernobyl 1986, Bhopal 1984 and Three Miles Island 1979.

The comparison gives two conclusions. First, the root causes of the accidents are found on the high system level.

Second, while there are different and often unique causes of accidents on the low system levels, the root causes on the macro-level have much in common.

The immediate cause of every big accident really seems to be unique:
- Estonia 1994: A locking device was fractured and the vessel collapsed.
- Challenger 1986. An O-ring failed and the space shuttle exploded.
- Chernobyl 1986. An unauthorized experiment caused the nuclear reactor failure.
- A chemical plant in Bhopal, India, 1984. A relief valve on a storage tank containing highly toxic methyl isocyanate (MIC) lifted. A cloud of MIC gas was released which drifted onto nearby housing.
- Three Miles Island 1979. The pumps in the secondary loop failed due to a slight malfunction and caused the nuclear reactor failure.

Behind the immediate causes very similar design compromises and organizational contradictions are found.

The investigation commission of Estonia disaster concluded in the final report: "The bow visor locking devices should have been several times stronger... Numerous bow visor incidents occurred prior to the accident on vessels built before... but the experience did not lead to systematic inspection and requirements for reinforcement of visor attachments. Information of bow visor incidents was not systematically collected, analysed and spread within the shipping industry." [3]

Bill Dettmer and Ellenb Domb have analyzed the Challenger accident ("Simplified TRIZ", pp. 229-233). The root cause was the decision of NASA to make cost the primary consideration in design and development.

John Manley, a participant in the Manhattan project for the development of the atomic bomb, wrote of Chernobyl and Challenger disasters:
"Complexity thus leads to an inherent paradox: it demands greater interaction between people and their technical systems, and among the people involved as creators, operators, and users. Yet the complexity generates an environment that makes this rapport more difficult." [6]

Yrjö Engeström, an expert in developmental work research and the theory of activity, reviews the literature on Three Miles Island and Bhopal accidents. Typical statements read:
Workers could not adapt to the demands of emergency which could not be anticipated. Workers were inflexible in their conceptual approach.
The operators and users needed much more systematic access to the information. Engeström concludes:
"This kind of development raises the inner contradictions of work to the surface." [2]

Reformulating Manley's statement, we can formulate an inherent contradiction "single-many":

A single organization - many organizations

Figure 1 illustrates the problem. Let´s suppose we will have seven persons or organizations instead one. Interaction or "rapport" will already become extremely complex. We need a single organization for simplicity and reliability, AND we need a complex one for good performance.

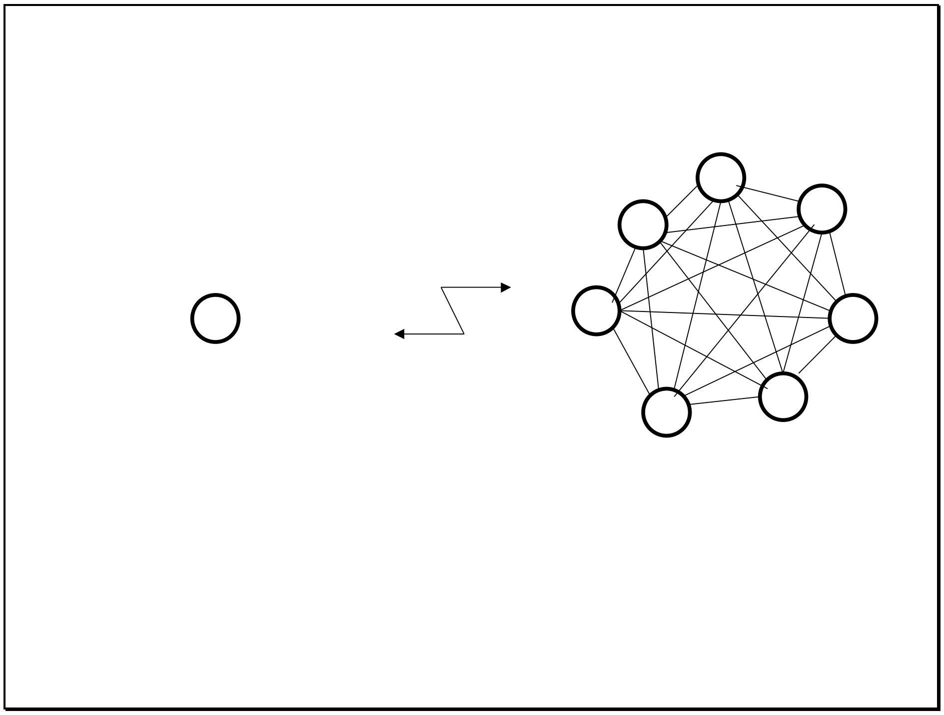

Figure 1: Increasing complexity, as increasing number of people and organizations, makes communication difficult.

There are ready solutions to the problem illustrated in Figure 1. For example, there Product Data Management (PDM) systems, where data is presented in common browsers. Many people communicate with one model. See Figure 2:

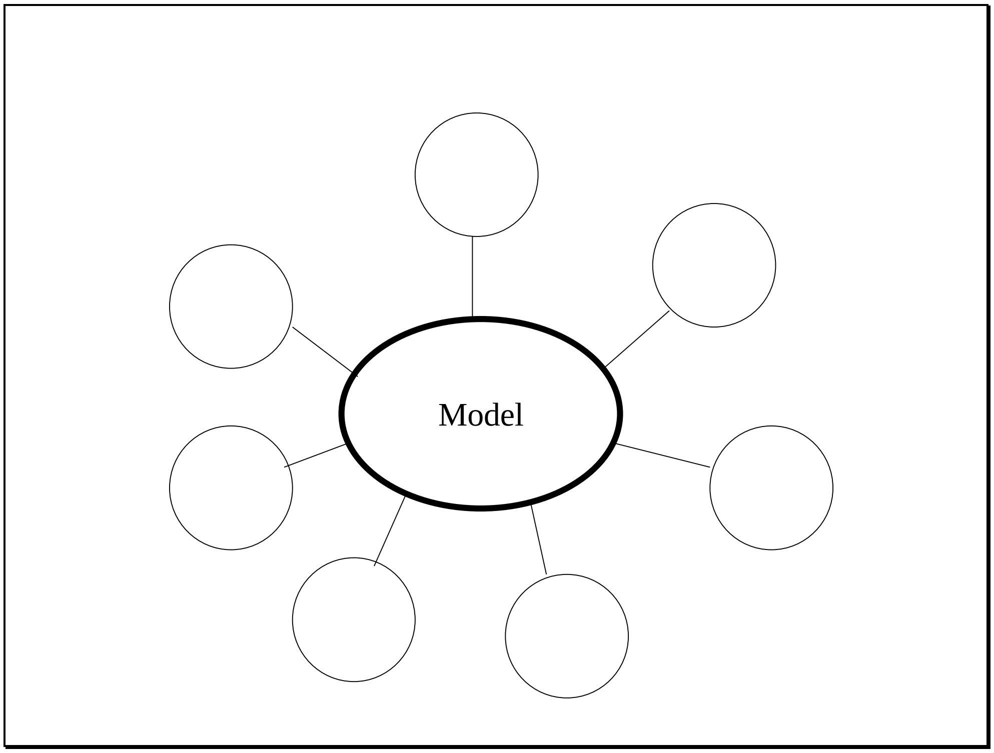

Figure 2: A shared model combines the benefits of simple and complex organizations.

The TRIZ Journal is also a shared model, making for thousands of people possible to communicate with each other.

To improve maritime safety, we can get the following new result: Networked transportation system with the shared model. Why not to make a common "safety database" for designers, shipping companies, insurance companies, government agencies and other related organizations?

Let's insert the results to the nine screen table:

	Past	Present	Future
Macro-level	Simple transportation system	Complex transportation system	Networked transportation system with the shared model
System	Locking device with the cylindrical pin	Locking device with the cylindrical pin	Locking device with the conical pin
Micro-level			

Table 1: The improvement in the system, the new locking device, will cause improvements on the macro-level system.

In the table we see that the locking mechanism has remained the same while the transportation system has become complex.

The better locking mechanism is a local solution. The further improvement of the transportation system requires changes on the macro-level, too

As we see, TRIZ allowed to get a simple solution, not found before. By the way, why? Perhaps one reason is that investigation commissions usually study experiences only in one industry. Most important problems and solutions, however, are common for many industries.

While the first two cases are totally completed, the case from maritime safety will continue yet years. How we can know that the idea is good?

The answer to the question can be find by excluding other alternatives. Can you imagine that there will be NO shared models in safety work in long run?

On the basis of solutions got and realized in many industries we also can predict the evolution of the system and check the quality of ideas. TRIZ makes the evaluation easier, allows to invest resources to right places and avoid expensive mistakes.

4 Discussion and Conclusions

Karen Gadd raises in her paper "Altshuller Father of Innovation - the Contradiction of TRIZ" [4] the problem of suspicions that TRIZ is "difficult".

I think the best way to show that TRIZ makes work more easy, not more difficult, is to produce good solutions and publish them for example in the TRIZ Journal. Real-life cases show well how much you need work and what results you get.

Gadd also writes of a "creativity guru" with a smattering of TRIZ. The remedy is the same. The best way, and often the only way to fight against bad work is to make good work and publish the results.

Brian Campbell writes on contradictions and Altshuller's matrix [1]. Should we speak only of contradictions, or tradeoffs and inherent contradictions? Or should we use other terms? Or is the whole discussion of terms only useless academic hairsplitting?

Again, the empirical research and the increasing number of cases will show, how to analyze contradictions best way. My experience so far has been that it is useful to go beneath surface and find the inherent contradiction.

About terms. You can solve problems with terms making simple experiments. Try to speak or write of problem solving and creativity to general audience. You will find that any jargon that is not necessary, should be excluded, and lay terms, if possible, used.

That's why I prefer the word "tradeoff" to words "technical contradiction", and "inherent contradiction" to "physical contradiction". Note that formulations as "inherent paradox" and "inner contradictions" have been already long time used across industries and sciences. See also the paper [8].

But there are more requirements. You should also talk precisely. Many organizational, economical and interpersonal contradictions have no relation to technology or physics. That is the reason to drop out adjectives "technical" and "physical".

Principles and the matrix seem to cause problems repeatedly. I am sure that here the simplest solution is the best.

I have found that in solving business problems all forty principles can be used together, while only some few principles work in solving a particular technological problem.

For example, principle 38: Strong oxidants. You always need to use emotions and appeal to feelings, if you want to get people interested in your product. Contrary, most people seldom need literally oxygen or other chemical oxidizers.

Since there are always business problems, even in the most "technological" projects, it is useful to go through all 40 principles. First time 25-30 principles give new ideas. Later all the rest principles occur to be useful, too.

Matrix can be used as an auxiliary tool, for getting additional ideas.

I have encouraged to solve problems and publish results. A question may be: How to publish, if the solutions are the proprietary information in companies? The answer: we should cultivate also "public domains" of creativity, as education and journalism.

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