Personal Report of Japan TRIZ Symposium 2009 (Part C. Integration of TRIZ with other methods) (Rev. by Toru ...

TRIZ Forum: Conference Report (22-C)



Personal Report of The Fifth TRIZ Symposium in Japan, 2009

Held by the Japan TRIZ Society, NPO, on Sept. 10-12, 2009, at National Women's Education Center (NWEC), Saitama, Japan

Part C. Integral Use of TRIZ with Relevant Methods

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[Posted on Dec. 6, 2009]



TRIZ Home Page in Japan

For going to Japanese pages, press Japanese translation of this page is not scheduled.

Editor's Note (Toru Nakagawa, Dec. 5, 2009)

This page is Part C of my Personal Report of Japan TRIZ Symposium 2009. Please see the Parent page for the overall description of the Symposium and the general introduction of the Personal Report. I am thankful to the Authors for their permitting me to cite their slides here for introduction.

Note: (TN, Mar. 11, 2010) Click here for the PDF file of this page of Personal Report.



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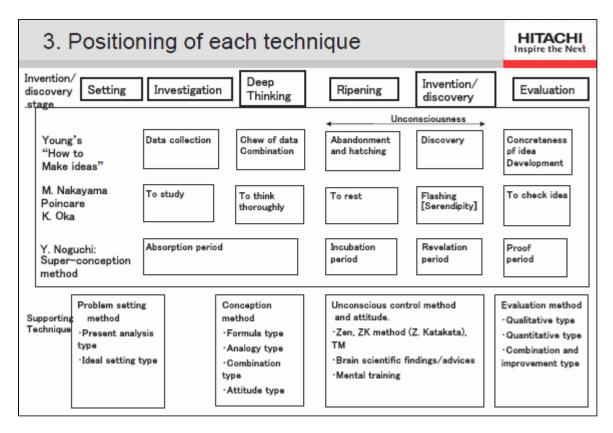
5. Integral Use of TRIZ with Relevant Methods

Toru Shonai, Junji Shigeta (Central Research Laboratory, Hitachi, Ltd.) [J13 P-A5] gave a Poster presentation on "Survey on Thinking Methods for Invention and Discovery — A Step for Combining TRIZ with non-TRIZ methods—". The Authors' Abstract is quoted here first:

We have been assisting inventive activities in a company's laboratory for a decade. TRIZ is the

only systematic methodology for inventive problem-solving, which is developing now. Although we consider it as the most reliable methodology for invention, because there are no empirical studies that TRIZ can assist for highly excellent inspirations beyond anyone's expectations in high probabilities, we had better absorb and exploit non-TRIZ methodologies aggressively. For this purpose, we are now investigating various inventive and inspiring methodologies from the past and distilling their essence. This presentation will describe Aristotle's and Peirce's philosophy of science, discovery method in geniuses in various academic fields, western and Japanese inspiring methods, approaches from brain science, and serendipity.

As stated in the Abstract, this presentation has a very wide scope of surveying research. In their Poster presentation, 15 detailed slides were shown both in Japanese and in English. For the sake of space here, I have to skip several slides where the Authors introduce individual methods, especially originated by Japanese researchers, including the Equivalent Transformation (ET) theory (by Kikuya Ichikawa), the KJ method (by Jiro Kawakita), and the NM method (by Masakazu Nakayama). [*** See an introductory paper on ET by K. Ichikawa (1966) in Japanese reproduced in this Web site "TRIZ Home Page in Japan" (2001) [Japanese]. The Authors show the positioning of various techniques along the commonly-understood invention/discovery stages (see slide below).



Then the Authors summarize the supporting techniques after classifying them in the 4 stages (see the bottom half of the above slide).

The first stage (slide right) is the problem setting (or (initial) approach for problem solving). The Authors recognize two basic approaches, i.e., one from the analysis of the present situations and the other from the setting of the ideal situations. Various methods coming from TRIZ or not are listed here.

The second stage is called Conception, i.e. generating concepts/ideas (see slide

4.1 Problem setting method (problem solving approach)

HITACHI

- Present analysis type:
 - What is the present problem? The problem to be solved and the approach method are determined by analyzing the circumstances.
 - TRIZ] Contradiction table, Su-field analysis, function graph, evolution pattern, S-curve, closed world method, and nine windows
 - [Not TRIZ]Cause/effect diagram, KT-PA/DA method, and QFD, etc. why-why analysis
- Ideal setting type:
 - The situation it should be and what should be done are set. It thinks about the ideal system.
 - TRIZ] IFR, SLP
 - Not TRIZ]For-what-expansion, breakthrough thinking (Nadler), KT-SA method, hope /fault/attribute listing etc.

right). One important type of methods for idea generation is called 'Formula type' by the Authors. TRIZ has a rich set of methods here. USIT is a derivative of TRIZ, while Hatanaka's idea operation method was developed independently of TRIZ. Second type of methods is called 'Analogy type' here. Several non-TRIZ methods are listed in this category.

4.2 Conception method

HITACHI Inspire the Nex

- Formula type:
 - Thinking ways and patterns, from which the idea comes out, are abstracted as list for formula.
 - TRIZ Invention principle, standard solution, operator, separation principle, evolution pattern, effects, trimming, and USIT solution techniques.
 - [Not TRIZ] Check list(Osborne), idea operation method (Hatanaka), etc.
- Analogy type:
 - The common feature that lurks in another system is found, and it applies it to the object system. An existing system is seen in a new aspect.
 - TRIZ] IFR, SLP
 - [Not TRIZ] Equivalent Transformation method (Ichikawa), papa mama creation theory (Hibino), NM method (Nakayama), synectics (Gordon), and biomics
- Combination type:
 - It thinks about a new combination of already-known elements.
 - TRIZ] None
 - [Not TRIZ] Morphological analysis (Zwicky), matrix method and KJ method

The Authors put the title of 'Attitude' in this slide (right). Referring to the previous slide of 'Positioning of the methods', the approaches/methods listed here belong partly to the second stage (i.e. Conception) and partly to the third stage (i.e. Unconscious ripening and invention/discovery). The Authors list here four types of methods, i.e., breaking psychological inertia, switching the brain mode, relaxation of mind, and inducement. There seems to be various approaches outside TRIZ, especially for trying to control or enhance unconscious thinking.

4.3 Attitude

Psychological inertia breaking tool

- TRIZ] STIC tool, SLP
- Not TRIZ] Lateral thinking (De Bono)
- Switch of brain mode:
 - Changing mode of thinking depend on what you think.
 - TRIZ None
 - Not TRIZ] Six color hat method (De Bono)
- Relaxation type:
 - The mental condition in which the idea comes out easily is made.
 - TRIZ None
 - [Not TRIZ] ZK method(Z. Katakata), forgetting after concentration (Poincare and Young, etc.).
- Inducement type:
 - Recomposing from scratch, writing down into sentences, trying to explains to others. Writing in figures, and Tabulating. Strolling around.
 - TRIZ] Whole, especially SLP
 - excluding TRIZ] KJ method etc.

The fourth stage is idea evaluation (slide right). The Authors list up 3 TRIZ methods as the Qualitative type. For the Quantitative type, they list 3 other non-TRIZ methods. (I suppose Hatanaka's method mentioned here is a derivative of Axiomatic Design.)

4.4 Idea evaluation

Qualitative type:

- It is evaluated based on trends of technological evolution, technological developmental stages, market, and the social backgrounds etc.
- TRIZ] Evolution pattern, S character curve, and multi screen
- [Not TRIZ] Awareness to importance of unexpected phenomenon and idea (serendipity)

Quantity type:

- It is evaluated concretely in consideration of all the limiting conditions.
- [TRIZ] None
- [Not TRIZ] Digital route (Equivalent Transformation), the design idea development (Hatanaka), Inspire as an amateur and do as an expert(Kanade)
- Further improvement of idea and combination
 - TRIZ] IWB
 - Not TRIZ JKJ method

The Conclusions written by the Authors are shown in the slide (below). Since they are carefully written, I just quote the slide in a large enough size for you to read.

Conclusions—ones TRIZ is lacking

Inspire the Next

- TRIZ is offering a lot of problem setting methods and conception methods.
 Especially, formula type tools.
 - The formula type conception method is a formula collection that extracts the idea from a past technology.
 - Because it is abstracted, covering range is wide. However, concrete technological images are insufficient.
 - There are few analogy type tools that induce concrete images easily.
 - Combining analogy type tools and attitude with TRIZ may result in more amount and higher quality of ideas (An attempt to using NM method with TRIZ has been done).
 - Although unconsciousness is important, the relevant methods are not included.
- "Problem discovery" that precedes the problem setting is important. It is still weak.
 - The technological forecasting of the future is a tool of this kind.
 - Can the tools of QFD and VE and tools of software requirement engineering be used?
- Remaining works: There are still a lot of fields not investigated yet.
 - Idea conception by illustration
 - Power of words of Japanese origin
 - Questioning-power and various frameworks, etc.

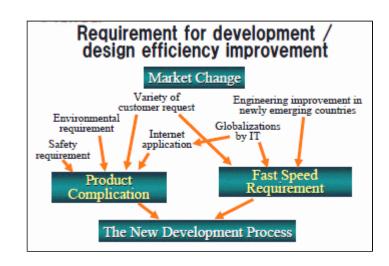
*** This presentation shows an excellent framework of the research the Authors have been carrying out and will further extend, I believe. For the sake of space, I have skipped several slides which describe individual methods of Japanese origin and References (mostly in Japanese). I wish the Authors extend this work further and publish the results step by step in the near future. It is my desire that the present site "TRIZ Home Page in Japan" becomes a base stage for their publications.

Osamu Kumasaka, Fumiko Kikuchi, Akio Fukushima (Pioneer Corp.) [J19 P-B2] gave a nice Poster presentation with the title of "The Role of TRIZ in the System of Monozukuri Solution Methods". This presentation is also based on an intensive wide-scoped research for many years, and has obtained the 'Best presentation for myself' Award after the voting by Japanese participants. 'Monozukuri' is the Japanese word for 'making things' in a wide sense, including all the processes of planning, designing, manufacturing, production, etc. The Authors' Abstract is quoted here:

Complication and difficulty of the Monozukuri process in Japan has been increasing according to the change of social condition. While many subject solution tools are introduced, some engineers are frustrated to choose one for their problem. Therefore a subject indexed matrix was systematized for the benefit to related engineers. And the role of TRIZ in this system was studied by means of evaluating interrelations and synergistic effects among those tools. As a result, possibility of TRIZ contribution was indicated on wide steps of the Monozukuri process as a new idea creation tool.

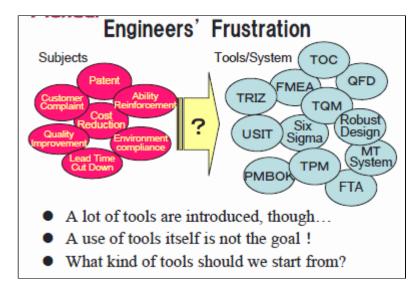
In the slide (right-upper), the Authors summarize the requirements on the engineers for improving the efficiency of developing/designing new products.

Such requirements come to the engineers in different forms, as shown in the next slide (right-lower). Engineers are requested to meet them and, of course, they want to fulfill the requirements as much as possible. But they are heavy tasks. A lot of methods and tools are introduced (in the world, or sometimes in the engineers' company). But usually each method/tool is explained/taught individually and hence

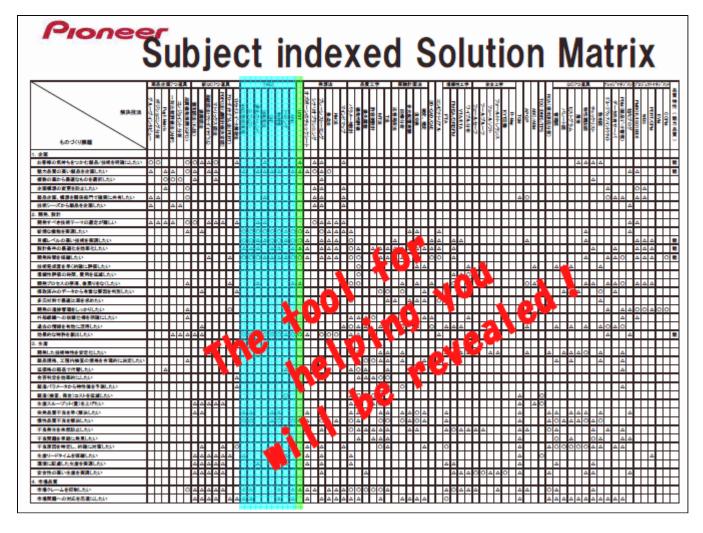


the engineers have to learn any of the methods/tools one by one before becoming able to apply it to their own job. Learning a method/tool and even using it are not their goal by themselves. The engineers want to obtain results in their jobs effectively. They want to learn what kind of methods/tools are useful for their purpose in their current stage of jobs and environments.

For improving such a situation of presenting methods and tools to the engineers, the Authors have built an Index Matrix for finding useful methods/tools from the current phases of jobs of Monozukuri. The key idea of making the Index Matrix is to list up the engineers' intentions/questions along the phases of the whole Monozukuri process.



The big table shown in the following slide (below) is the Index Matrix for finding useful methods/tools from the subjects/requests in various phases of Monozukuri process. The Authors built this table and posted it in their intranet Web site in Pioneer Corp. The Index Matrix is so big that you cannot read the individual rows of subjects and individual columns of methods/tools. In individual cells, the circle states that the method/tool is effective for the subject/requirement, while the triangle represents partial/weak effectiveness. The columns in light blue show 8 components of TRIZ and another column in green shows USIT.



For realizing the value of this Index Matrix, we should closely look at the subjects (rows) and the methods (columns). The subjects (written in Japanese) are composed of:

- 1. Planning:
 - -- Want to find a key product/technology which can grasp the hearts of customers.
 - -- Want to plan a product which can have highly attractive quality.
 - -- Want to select the best among multiple of alternative plans. (and 3 more rows.)
- 2. Development & designing:
 - -- Want to define the technologies which we should develop for ourselves.
 - -- Want to realize a novel functionality.
 - -- Want to reduce the time of technology development. (and 11 more rows)
- 3. Manufacturing:
 - -- Want to stabilize (or make robust) the newly-developed product characteristics.
- -- Want to define rationally the standards and tolerances of products and of process inspections.
 - -- Want to replace a part of the system with cheaper ones. (and 12 more rows)
- 4. Quality in the market:
 - -- Want to reduce the claims for the market.
 - -- Want to respond more quickly to the market problems.

The methods and tools in the columns are:

- 7 tools for merchandise planning (including: group interview, Pugh's matrix, AHP, QFD, etc.)
- New 7 tools for QC (including: KJ method (or Affinity diagram), Relations diagram, PDPC, etc.)
- TRIZ (including: 40 Inventive Principles, Effects DB, Trends of evolution, 9 windows, SLP, Su-field analysis, Trimming, and ARIZ)
- USIT
- Idea generation methods (including: Brainstorming, NM (Masakazu Nakayama) method, Mind mapping, etc.)
- Quality engineering (or Taguchi method) (including: Parameter design, Functionality evaluation, etc.)
- Design of Experiment (including: Regression analysis, etc.)
- 3D CAD/CAE
- Reliability engineering (including: FMEA/DRBFM, etc.)
- Safety engineering (including: Fail safe, Fault tolerance, etc.)
- TQM
- TOC
- RCA (Root cause analysis)
- 7 tools for QC (including: Cause-effect diagram (or Fish bone diagram), Scattered diagram, etc.)
- Knowledge management (including: Groupware/intranet site, Data sharing server, etc.)
- Project management (including: PMBOK, PERT/CPM, CCPM, etc.)
- Quality characteristics (or Attractive quality)
- etc.

*** As shown above, the Index Matrix built and provided in the company's intranet site contains a very rich information about many methods and their effectiveness evaluation. This presentation is indeed a valuable contribution to the industrial and technological society. The contents of the Index Matrix should be validated and refined by many people. And the Index Matrix will give us number of suggestions for further development in various technological methodologies. Congratulations to the Award given by the paticpants voting!

Koji Tsumagari, Masaaki Sakai (Logo Corp.) [J27 O-17] gave an Oral presentation with the title of "Make an Effective Use of TRIZ Result: Project Management with TOC and the Practical Use". The Authors' Abstract is quoted below.

For the product in own core business can be achievable with accustomed ordinary processes, that the market introduction would have no matter. To use TRIZ method effectively for smooth market introduction it is necessary to involve an appropriate set up plan. In case of the product is innovative and revolutionary, the product procedures development through production & logistics will have new tasks which nobody has the experience and the procedures see the stake-

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holder changes as inevitable. In other words, the framework like the new business establishment is necessary. The project management method comes in valuable for this solution. We introduce "Project Management CCPM / 6 Modules with TOC" which the authors developed the method for Japanese engineers including TRIZ practitioner.

This presentation was given in Japanese without slides in English.

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