TRIZ Forum: Conference Report (20)

Personal Report of The Fourth TRIZ Symposium in Japan, 2008

Held by the Japan TRIZ Society, NPO, on Sept. 10-12, 2009, at Laforet Biwako, Moriyama, Shiga, Japan

Toru Nakagawa (Osaka Gakuin Univ., Japan),
Oct. 26, 2008

[Posted on Oct. 26, 2008; minor revision: Oct. 30, 2008]

TRIZ Home Page in Japan

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

Editor's Note (Toru Nakagawa, Sept. 24, 2008)

We held the 'Fourth TRIZ Symposium in Japan' with 180 participants (including 15 from overseas) and 46 presentations (including 13 by overseas presenters). Here is my personal report of the Symposium for the purpose of introducing this significant TRIZ event held in Japan to people all over the world who are interested in TRIZ and its applications. Please refer to the Official Reports and Documents posted in the Official Pages of the Organizer, Japan TRIZ Society (and also in the Official Pages of the former 'Japan TRIZ CB').

The present report is written 'personally' along the line of my series of 'Personal Reports' of important TRIZ conferences, including TRIZCONs in USA, ETRIA TFCs in Europe, and TRIZ Symposia in Japan. I would like to introduce you to the present Symposium, especially in its scientific contents, in a manner as fair as possible even under the limitation of my personal view. I served as the Chairperson of the Program Committee of the Symposium, but my main face here is just a researcher in TRIZ who has been working to promote TRIZ. A report of this kind would be helpful, I believe, for you to understand the current TRIZ situations in Japan and the world and for you to read some further documents. (For some more description about my intentions in writing 'Personal Reports', please refer to my previous reports (e.g.,).) The paragraph starting with *** shows my (especially) personal comments.

Since the number and contents of the presentations have increased much this year, it has become increasingly difficult for me to write a report in detail. But anyway I will try to make this report as comprehensive as possible for the readers who did not attend at each presentation.

[Note (Toru Nakagawa, Oct. 26, 2008): I finished writing this draft on Oct. 19, 2008, and requested the Authors for their permission of my citing their slides. Finalizing the report, I am going to post it here rather in a hurry before I have to depart for ETRIA TFC 2008. I will post the report only in English at moment, and will post its abstract in Japanese after I come back from ETRIA TFC. Since this report has become so long (about 65 printed pages), I also post this in PDF (4.2 MB).]

Contents:

[Note (Oct. 26, 2008, TN)] Japan TRIZ Society has decided to post the slides/papers of Keynote Lectures and Invited Talks in its Official Web site, but is under discussion whether and how to post the slides/papers of contributed papers in its Official Web site. "TRIZ Home Page in Japan", on the other hand, are going to post the slides/papers of selected presentations including contributed papers, under the permission by the Authors with some time delay from the Symposium.

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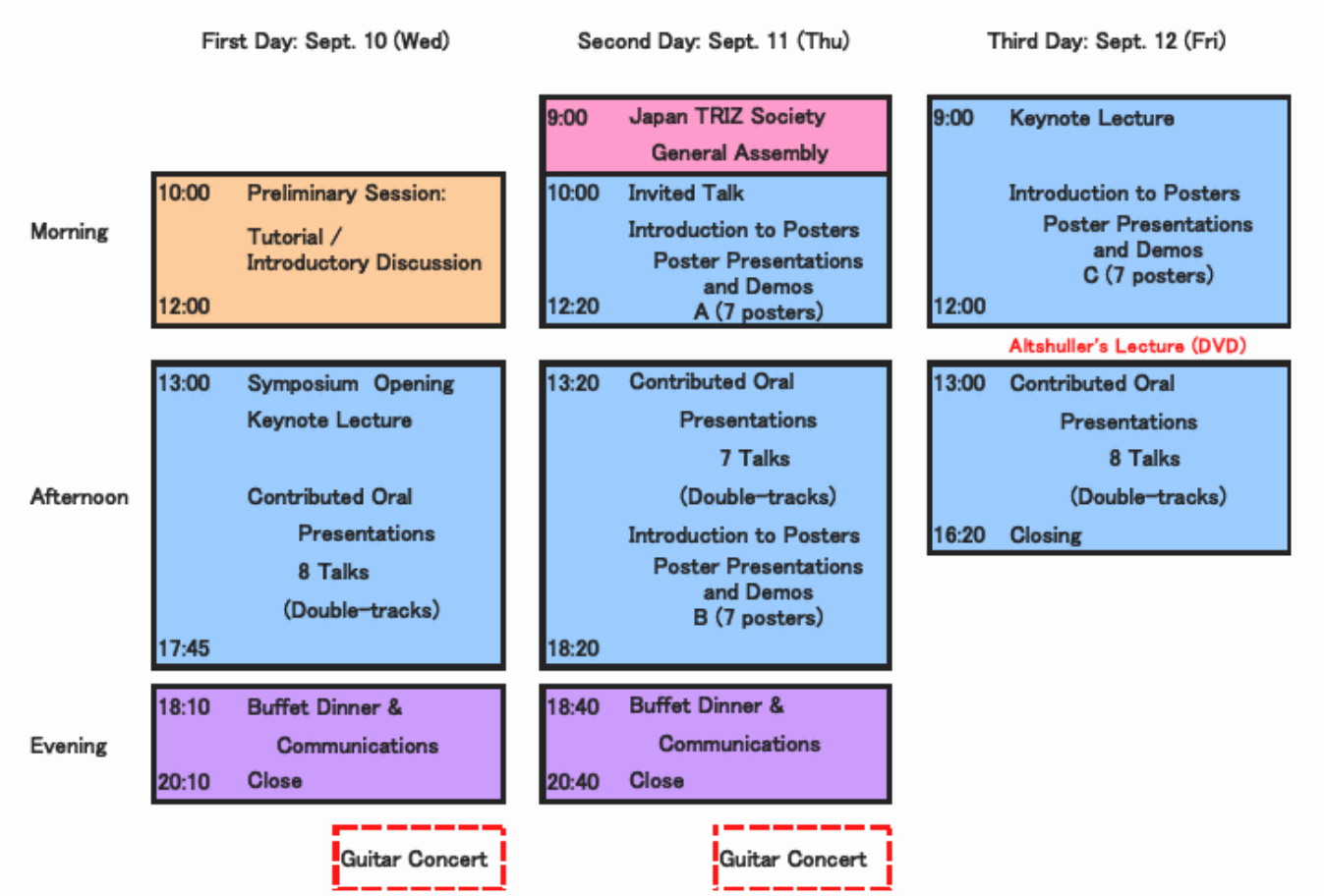
1. Outline of the Symposium

Name of the conference:	The Fourth TRIZ Symposium in Japan, 2008
Date:	Sept. 10, 2008 (Wed.) 10:00 -- Sept. 12, 2008 (Fri.) 16:20 (3 days)
Location:	Laforet Biwako, Moriyama City, Shiga Prefecture, Japan (A resort hotel and conference facility, located on the shore of Lake Biwa, near Kyoto)
Held by:	The Japan TRIZ Society, NPO Engl (Chairperson of Board: Toshihiro Hayashi (T. Hayashi Professional Engineer's Office))
Participants:	180 in total (165 from all over Japan, and 15 from overseas)
Presentations:	2 Keynote Lectures, 1 Invited Talk, 1 Tutorial, 23 Oral Presentations, 20 Poster Presentations, 2 Opening/closing addresses, 1 Position Paper, 2 Discussion sessions.
Proceedings:	English Edition and Edition for Japanese people

Please refer to the Official pages Engl Jap. for the Agenda (in a sheet) Engl PDF, the detailed Agenda (in a tabular form) Engl PDF, Abstracts Engl PDF, etc. The Opening Address Engl PDF by **Toshihiro Hayashi** (Chairperson of Japan TRIZ Society) [to be posted later] is also useful as an overall view of the present Symposium.

The whole Symposium was carried out almost exactly in the order and in the time table as shown beforehand in the Advanced Agenda Engl PDF , except that one paper [O-14 #44] was not presented and that Mr. Altshuller's lecture video (in 1974) was shown during the lunch time of the third day.



Presentations are referred here in [ ] with the session name, e.g. O-14 for reference in the Agenda, and the paper submission number, e.g. #44 for reference in the Abstracts. The Keynote Lectures and the Invited Talk are going to the posted in the Official pages of Japan TRIZ Society Engl [to be posted later]. Some of contributed

presentations will be posted later in this Web site, "TRIZ Home Page in Japan".

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2. Organization of the Symposium (with some pre-history)

The present Symposium is the fourth one annually held in Japan by the former 'Collaborative Board of TRIZ Promoters and Users in Japan' Engl. and its successor 'Japan TRIZ Society, NPO' Engl. Jap. . Japan TRIZ Society was officially approved by the Tokyo Metropolitan Government in December 2007. The Society has about 140 members and is operated about 20 voluntary managing members (see.).

The following table briefly summarizes the growth of our TRIZ Symposia in Japan for these four years:

	First TRIZ シンポジウム 2005 The First TRIZ Symposium in Japan	Second TRIZ シンポジウム 2006 The Second TRIZ Symposium in Japan	Third TRIZ シンポジウム 2007 The Third TRIZ Symposium in Japan	Fourth TRIZ シンポジウム 2008 The Fourth TRIZ Symposium in Japan
Date	Sept. 1 (Thu) - 3 (Sat), 2005	Aug. 31 (Thu) - Sept. 2 (Sat), 2006	Aug. 30 (Thu) - Sept. 1 (Sat), 2007	Sept. 10 (Wed) - 12 (Fri), 2008
Place	Laforet Shuzenji, Izu, Shizuoka	Pana-Hills Osaka, Suita, Osaka	TOSHIBA Kenshu Center, Yokohama	Laforet Biwako, Moriyama, Shiga
Organizer	Japan TRIZ CB	Japan TRIZ CB	Japan TRIZ CB	Japan TRIZ Society
Invited talks	Keynotes: 2 (T. Nakagawa; D. Mann) ; Vendor talks: 4 (Y. Konishi; M. Sawaguchi; M. Hotta; M. Zenko)	Keynotes: 2 (H. J. Linde; E. Sickafus): Invited talks: 2 (S. Hibino; K. Yamaguchi) Introductory: 1 (M. Sawaguchi)	Keynotes: 2 (L. Ball; S. Dewulf); Invited talks: 3 (T. Hayashi; S. Tamai; N. Okuzumi); Tutorials: 2 (N. Nagase; M. Sawaguchi)	Keynotes: 2 (A. Roggel, S. Ikovenko); Invited talk: 1 (Y. Fukushima); Tutorial: 1 (M. Hotta)
Contributed papers	11 Oral presentations; 5 Poster presentations	17 Oral presentations; 12 Poster presentations	15 Oral presentations; 14 Poster presentations	23 Oral presentations; 20 Poster presentations
Other features	Opening & Closing Addresses; Closing discussion	Opening & Closing Addresses	Opening & Closing Addresses; Meeting of Japan TRIZ CB & Japan TRIZ Society.	Opening & Closing Addresses; Introductory Discussion, feedback discussion; General Assembly Meeting of Japan TRIZ Society
Participants	104 (Japan 100; overseas 4)	157 (Japan 139; overseas 18)	202 (Japan 191; overseas 11)	180 (Japan 165; overseas 15)
Official Report	2005 Pre Engl., Post Engl.	2006 Pre Engl., Post Engl.	2007 Pre Engl., Post Engl.	2008 Pre Engl., Post
Personal Report	Nakagawa 2005 Engl. Jap.	Nakagawa 2006 Engl. Jap.	Nakagawa 2007 Engl. Jap.	Nakagawa 2008 Engl. Jap.

The TRIZ Symposium was started as an open National conference on TRIZ in 2005 and then have added the International features little by little since 2006. For overcoming the language barriers we have needed much efforts. And the efforts have been supported by many presenters/participants/volunteers from Japan and abroad and resulted in much success. I would like to state **our policy of organizing this Symposium** with minor modification of my 2006 report:

> For the Fourth TRIZ Symposium, we set its goals in three main points, essentially the same as in the preceding years:
>
> (1) The first goal is to make the Symposium **an open and active conference** of all the people involved in TRIZ on the basis of **a standard procedure as an academic conference**. This procedure was actually carried out very smoothly: In Dec. 2007 we announced the outline, including the date and the place, of the Symposium. In Feb. 2008, we announced the plan of Symposium and called for papers openly (both in Japanese and in English) , while in March we announced three Invited/Keynote speakers. In May, by receiving one-page extended abstracts of contributed papers, we reviewed them and set up an advanced agenda. In early June, we announced the advanced agenda together with the

abstracts and called for participation openly . The final manuscripts of slides and (optional) full papers were collected by the end of July (the official due date), and prepared for publishing the Proceedings. We are very happy and proud of having done all these smoothly, as you see the Agenda carried out actually has only very minor changes in the Advanced Agenda announced in June, i.e. three months prior to the Symposium.

You may notice that we **do not adopt the procedure of peer-reviewing of full papers**. The screening is done by a very small (4-membered) Program Committee on the basis of extended abstract of one full page; and almost all the submitted abstracts are accepted. Then the Advanced Agenda is decided by the Organizing Committee (7-membered, including the Program Committee) and then by the Managing Meeting of Japan TRIZ Society. The final manuscripts are quickly checked (and sometimes advised) by the Program Committee but not reviewed/screened. Thus the authors, and not the Committee, should have the full responsibility for the contents of the presentations. The choice of Oral or Poster presentations were mostly (or nearly entirely, this year) based on the Author's preferences. These policies are made for the purpose of encouraging people to give presentations. We think the one-page extended abstracts have enough information for the Program Committee to roughly evaluate the quality of the paper and to set up the Agenda in a sensible and appropriate manner.

(2) The second main goal was to **provide as much opportunities of presentation and discussion** among all the participants. We would like to have **as many and as high-quality presentations as possible**.

The reviewing/screening policies mentioned in (1) are taken of course for this purpose.

The choices of **presentation styles** should be considered carefully; especially choice of either oral or poster, and choice of either plenary, double track, or multiple tracks. We want to keep enough time for presentation and discussion for each paper and need to accommodate as many as nearly 50 papers in the limited period of time.

We have chosen the oral sessions to be 60 minutes (45 min. talk + 15 min. Q&A) for keynote lectures and 40 minutes (30 min. talk + 10 min. Q&A) for invited and contributed papers. This length of time is found both necessary and sufficient in almost all cases. We have to choose double tracks for all the contributed oral presentations (and no single track contributed papers).

We also had three **Poster & Demo Sessions** for multiple parallel presentations. We carried out these sessions as follows: We had a short plenary session for 'Introduction to Posters' where every author outlines their work in 3 minutes by using only 2 to 4 slides. Then after moving to separate rooms we had the Poster & Demo Session of 7 posters in parallel. By using max 16 slide pages, the presenters gave a short talk (and discussion) of 15 min. and repeated it two, three times during the 70 min. session. Almost all the Symposium participants visited a few poster presentations one after another. Presenters at the Poster sessions reported afterwards that they presented and discussed for full 70 minutes with eager participants and that they were glad to have given their presentations in the form of posters. --- We feel some types of presentations are suitable for posters and some others for oral talks.

(3) The third main goal was to increase the International nature of the Symposium by somehow overcoming the language barriers. 'Either National OR International' is a form of ordinary choice enforced by a contradiction. We set the target of the Symposium as '**Primarily National AND Partially (as much as possible) International**' since 2006 and have already established our own way of achieving this target.

The ordinary solution of **overcoming language barriers** (between Japanese and English languages, in the present case) would be using interpreters. This solution faces with the difficulties in getting skilled interpreters and in cost; Moreover, sequential interpretation loses half of the time while simultaneous interpretation needs special facilities. In contrast to such an oral/temporary/contemporary assistance, we have chosen a new solution based on visual/preparative/permanent assistance. We have translated the slides beforehand and projected the slides in two languages in parallel, and published the Proceedings in the two language editions. This is a solution based on 'Prior Action' and 'Using Another Sense' (visual assistance). The solution was implemented by the cooperation of Japanese authors to provide both Japanese and English slides and by the organizing members' work of supporting the Japanese authors and also of translating English slides into Japanese. The translation work was also supported by a number of voluntary people outside the organizing members, whereas on the other hand some Japanese authors chose the option of no English translation, which was approved as a practical choice.

This solution has been evaluated highly by most of the participants and even Japanese authors, according to their answers to our post-conference inquiry. It is useful and good enough for most of Japanese people, who understand English more or less in listening. For people from overseas,

however, this solution is helpful to a large extent but not fully, depending on the ways of making slides. When the authors write only keywords and schematics in the slides and present the logics only in talks in Japanese, overseas participants feel much frustrations.

Discussions in most oral presentations (i.e. all oral presentations having slides in two languages) are sequentially interpreted in both directions. This was done by two organizing members and three more voluntary people.

In this Symposium, submission of **presentation slides is requested,** while submission of full paper is optional. This policy is preferred by many Japanese industrial people, because writing a full paper is a heavy burden for them. As a results, 4 full papers are submitted in Japanese, while 8 in English. -- This issue need to be considered and improved further step by step.

Anyway, this year we received **15 overseas participants giving 13 presentations** (plus one more 'Position Paper'). The presentations were given by the people coming from USA, Israel, UK, Austria, Malaysia, Korea, Taiwan, and China (for Position Paper). We are very happy to have received world leaders in TRIZ and also people working actively in Asian countries.

As you see, the style of our Japan TRIZ Symposium has been established and extended since 2005 and has brought a big success in the rapid and steady growth in the numbers of presentations and participants. This year we faced some overload on the organizers due to a large increase in the number of presentations but have overcome the difficulty by the **voluntary cooperation** of nearly 10 people outside the organizing members.

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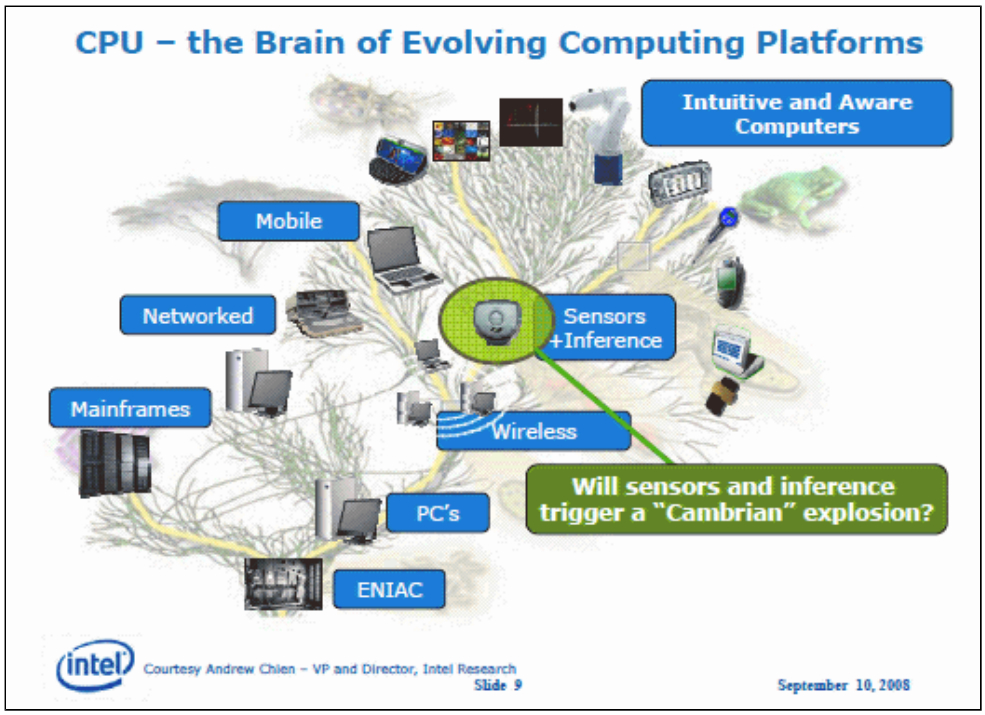
3. Keynote Lectures

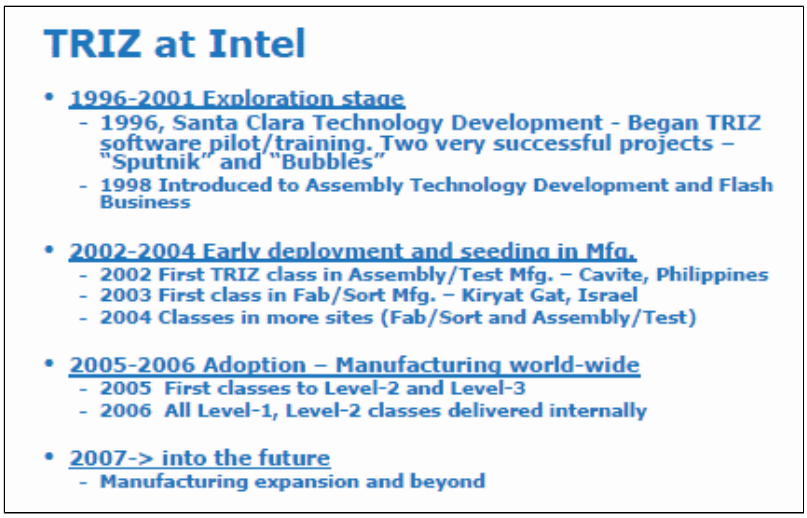
Keynote Lectures were given by Amir Roggel from Intel and by Sergei Ikovenko, TRIZ Master, GEN3 Partners.

Amir Roggel (Intel, Israel) [K-1, I02] gave a Keynote Lecture with the title of "**Can TRIZ Work for a Large, Innovative Semiconductor Company? Intel's Learning**". He talked first about general view of technology in the 20th century and then in the 21st century. The slide (by courtesy of Andrew Chien, VP and Director, Intel Research) shown below was impressive to me.

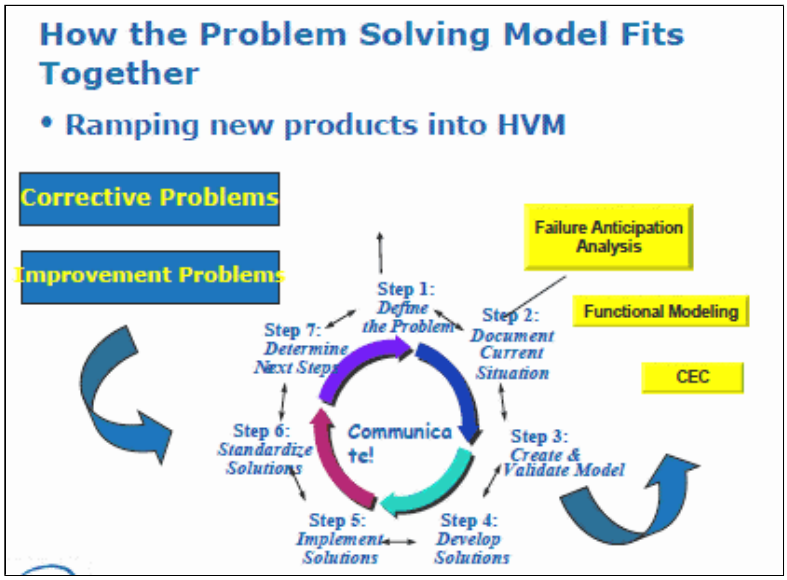


The history of TRIZ in Intel is shown in the slide. The period 2002-2004 was the start of the current big deployment of TRIZ in Intel, especially in the manufacturing divisions.

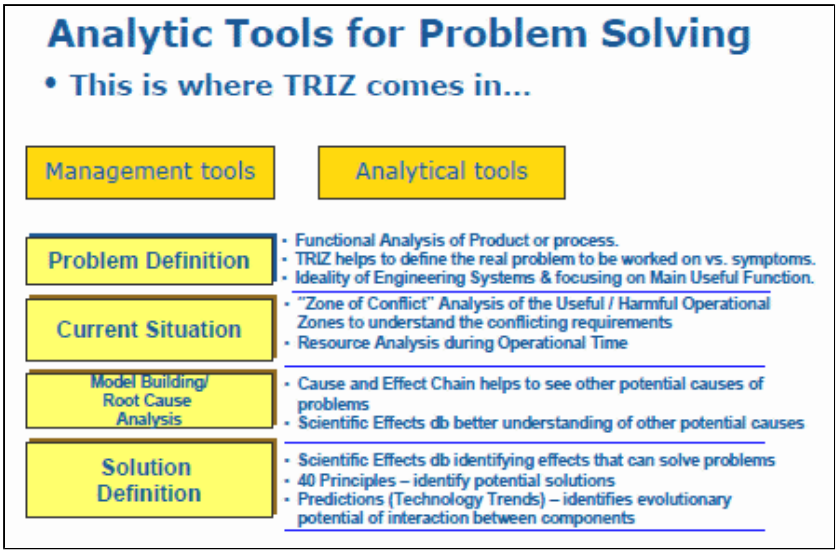
In the manufacturing, they recognize four main aspects, they are: Ramping new products into high volume manufacturing, Yields, Tool productivity, and Cost and agility.



Corresponding to these four aspects, they use different TRIZ tools. For example, in the problem solving for the purpose of ramping new products into high volume manufacturing, the tools are used as shown in the right figure. Details of these problem solving procedures and usage of tools were not explained in the Keynote Lecture, but were demonstrated well in the three case studies presented by his colleagues from Intel Malaysia.



They have listed the analytical tools for problem solving, mostly coming from TRIZ.



The following two slides show their accomplishment and challenges and their conclusions.

Accomplishment and Challenges

- TRIZ has generated significant benefit for Intel as measured by time to solutions and cost saving
- Challenges in deployment of TRIZ in Intel
  - Strengthening existing uses
  - Propagate to new areas of use
- Tips for other companies who want to deploy TRIZ
  - TRIZ is not "Magic Wand": it requires hard work and investment, and deliver great results to those who do it
  - The 4 conditions required to make TRIZ successful in a company...

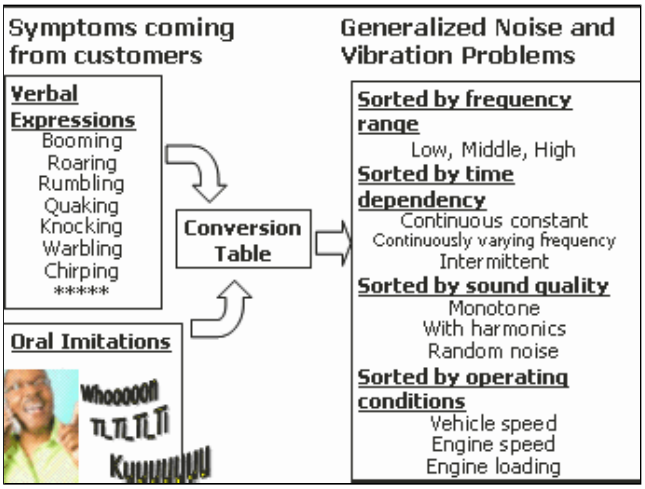
Conclusions

- TRIZ is a key systematic innovation platform for Intel into 21st century
- Our manufacturing challenge: Improve productivity and efficiency without compromise
- Application of TRIZ in R&D and management are evolving: to improve and develop systems and processes throughout Intel
- TRIZ offers both tactical and strategic capability for companies. It is only the beginning...

*** Intel's company-wide activities for promoting TRIZ are very impressive. See their three case studies presented in this Symposium by Intel Malaysia. Amir Roggel was very active in communicating with the Symposium participants; he obtained over 100 business cards from the participants through personal communications during this Symposium, he says.

Dr. Sergei Ikovenko (GEN3 Partners / MIT, USA) [K-2, I01] gave the second Keynote Lecture on the Third day morning, with the title of "**Directions for Future TRIZ Development and Applications.**" In the early days of TRIZ introduction into Japan, around 1997-2000, Dr. Ikovenko visited Japan many times as the instructor of TRIZ and TechOptimizer. Thus a large number of Japanese participants are already familiar with him.

His main message is to think of innovation from the eyes of business management. For this purpose, TRIZ can provide a new view of 'Voice of the Technology' to the product in addition to the standard, but not certain, approach of 'Voice of the Customer'.



The main concepts for revealing the 'Voice of Technology' are shown in the right slide.

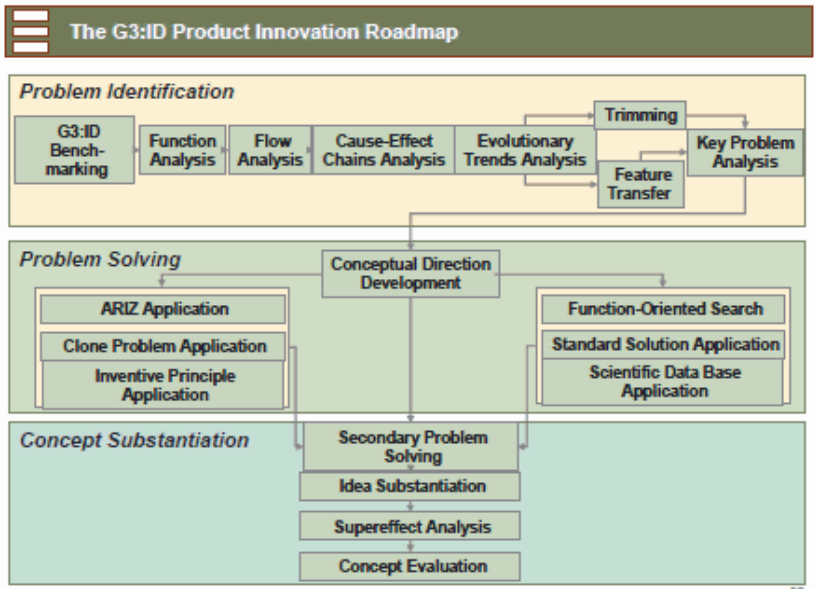
Main Parameters of Value – Definitions and General Logic

- Main Strategic Parameters of Value (MSPV) are the Product attributes that define Customer behavior on the market
- Main Functional Parameters of Value (MFPV) are objective technical (physical, chemical, geometrical, biological, *etc.*) parameters that are responsible for MSPV
- Traditional parameters (like Performance, Convenience, Safety, Styling, Indulgence, Cost, etc.) are too general, and are not instrumental for innovation
- Not all these parameters are equally important to customers (usually, only 2-3 SPV are really MSPV)
- There are some latent parameters that are not even recognized by the market as MSPV. Process the Voice of the Customer – do not take it literally.
- For different market segments, MSPV are different

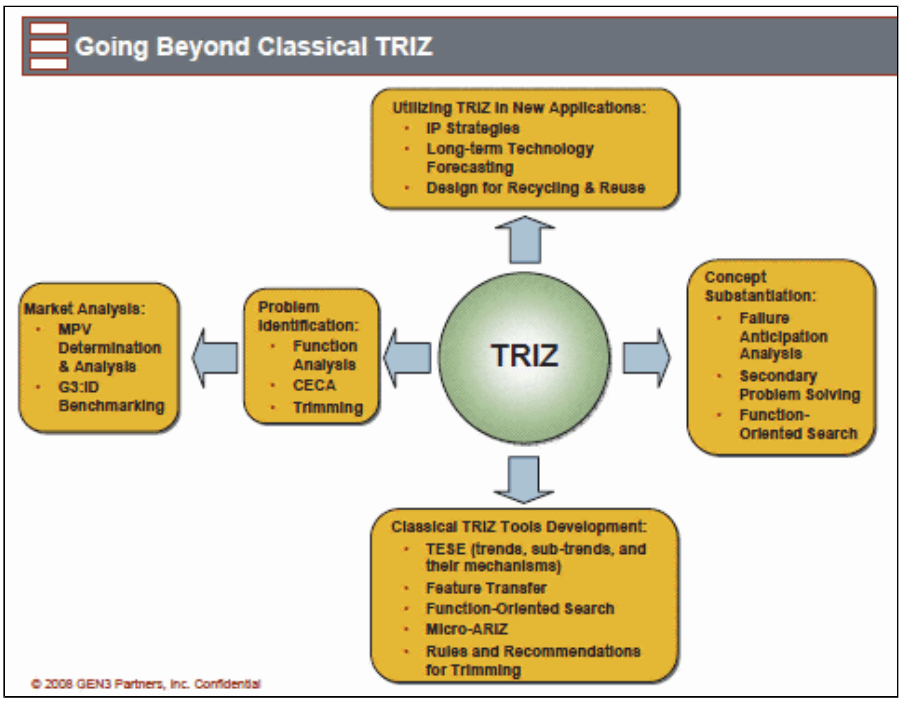
The table shown at the right illustrates a method of breaking down the concept at the Strategic MPV level into more closely related technical terms.

Strategic MPV	1 Level MPV	2 Level MPV	3 Level MPV (MFPV)
Fuel Economy	Aerodynamic drag	▸ Form drag ▸ Resistance from friction against external surfaces ▸ Resistance generated by protruding parts of the car ▸ Turbulence resistance	▸ Air density ▸ Air viscosity ▸ Air temperature ▸ Area of the largest cross-section of the car ▸ Car speed ▸ Shape (size) of cabin, fairings, trailer ▸ Material surface energy ▸ Van-der-Waals forces (forces of mutual attraction of molecules)
	Cost effectiveness of engine	Engine efficiency	▸ Combusting temperature of combustible mixture ▸ Combustible mixture density ▸ Size (arrangement) of piston-rod group ▸ Size of particles of atomized fuel ▸ Air temperature ▸ Uniformity of fuel mixture spray ▸ Excessive air coefficient
	Rolling resistance	▸ Structure (composition) of road surface ▸ Truck weight ▸ Weight of cargo carried ▸ Quality and number of rolling contact bearings	▸ Unevenness of road surface ▸ Unevenness of tire surface ▸ Shape (relief) of tire protector ▸ Mechanical parameters (rigidity, elasticity) of tire ▸ Metal density ▸ Size of point of contact between wheel and road pavement ▸ Load on one axis of truck ▸ Optimality of load-bearing structure

The process for the product innovation are shown in the right figure. Various tools coming from TRIZ and some modern methods are shown in this figure.



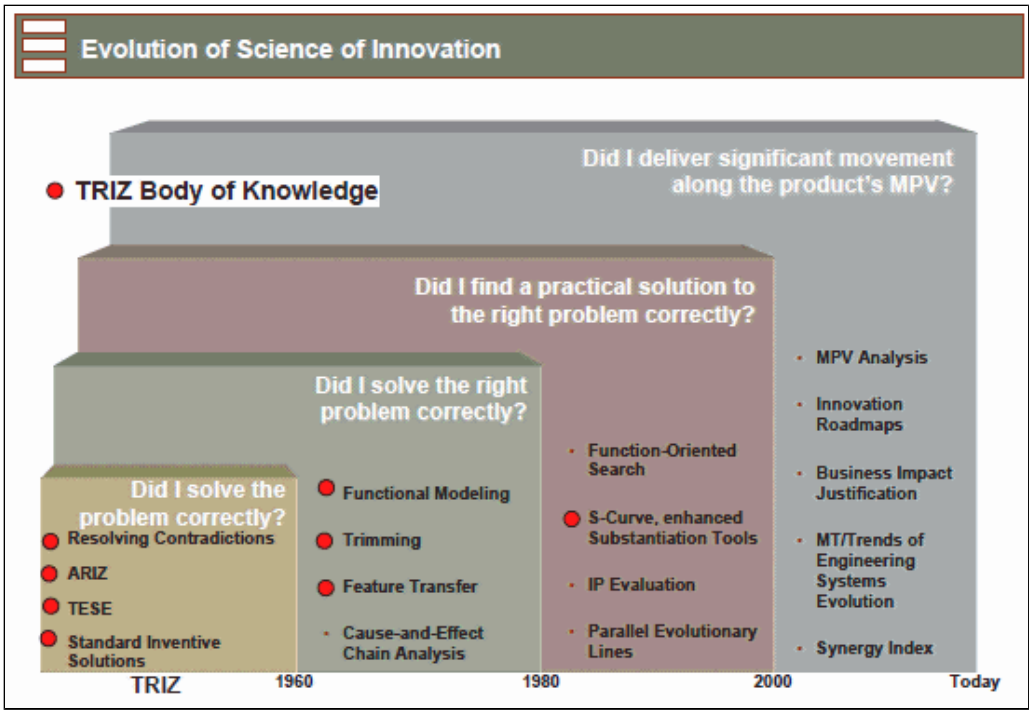
The directions of extending TRIZ are summarized in the figure shown right. At the central row of the figure, the methods are show to be used in the earlier stages of market analysis and problem identification and in the afterward stage of concept substantiation. At the bottom, necessity of further development of some components of classical TRIZ tools is described. At the top, needs of utilizing TRIZ in new applications are illustrated.



The components of

various tools are well summarized in the figure shown right. TRIZ evolves towards a science of innovation by extending its target, or the issue of question.

During the discussion, 'the range of TRIZ' was asked. Dr. Ikovenko answered that 'TRIZ Body of Knowledge' was recently defined as the materials approved by Mr. Altshuller, and that the red circles (added by TN) indicate such items.



Dr. Ikovenko also discussed the usage of S-curve analysis, in particular the S-curve analysis of TRIZ itself. He said that TRIZ in the global scale is still in the infancy stage. Any product in such a stage should find its proper niche field to grow. For TRIZ, its proper niche is the filed of 'problem solving in technologies' without doubt. Thus we should make our best to apply TRIZ to solve industrial technical problems and to make TRIZ strong in such field.

*** The last message for TRIZ to find its own niche in the technical problem solving was stated clearly. Thus, even though there are various interesting and important 'Directions for Future TRIZ Development and Applications', we should remember that we need to make TRIZ strong and successful in its original field of technical problem solving. The approach of 'Main Strategic Parameters of Values (MSPV)' is also addressed to this point.

Presentation slides of the two Keynote Lectures will be posted in the Official site of Japan TRIZ Society.

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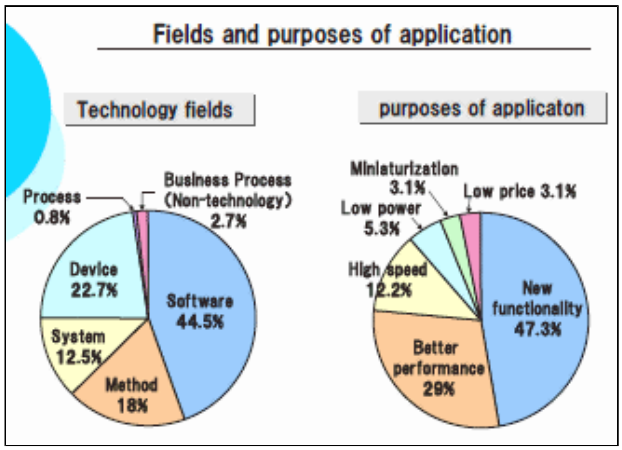
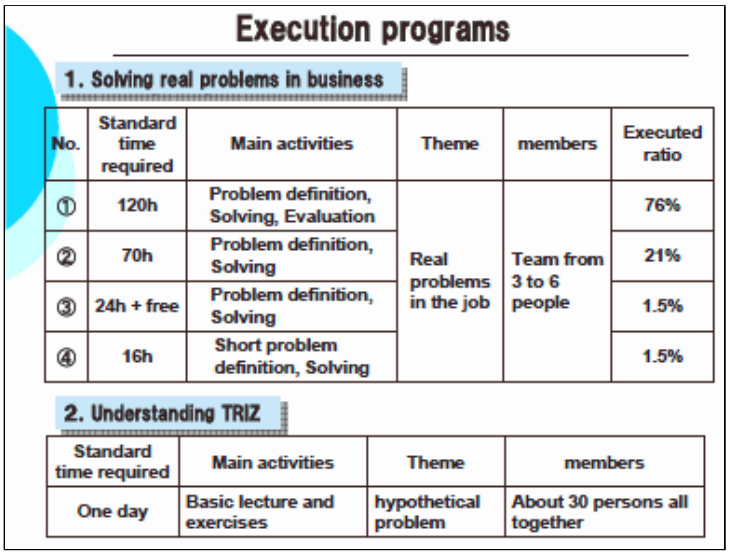
4. Invited Talk and Tutorial

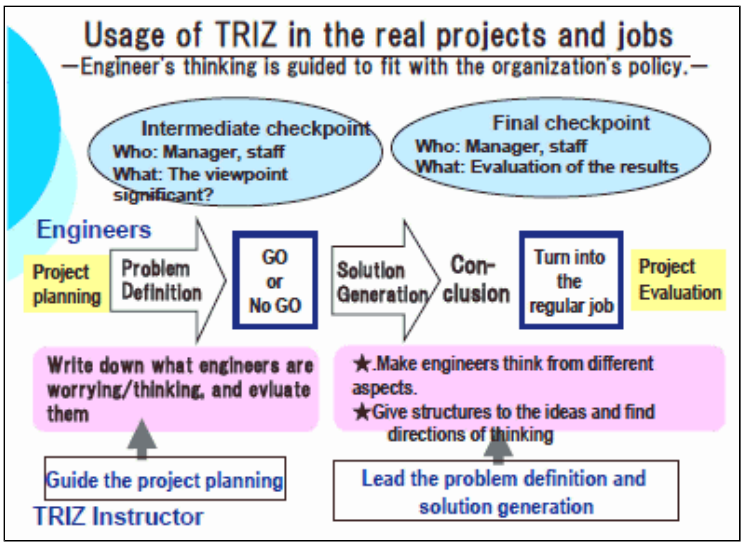
Yojiro Fukushima (Matsushita Electric Industrial Co., Ltd.) [I-1 #I03] gave an invited talk on "**TRIZ activity in Corporate R&D Division —Application to system, method, and software technology —**". Application of TRIZ to IT and software field has been an important direction useful for many Japanese (and other countries') industries. Yojiro Fukushima reported their 5-year experiences of carrying out 150 real TRIZ projects in this field.

They started one-day TRIZ training in 2003 and then problem solving projects with the aid of TRIZ in their real jobs. The following graphs show their fields and purposes of TRIZ application in these projects. And the tables show their ways of training (below) and of performing the application projects in small engineering teams. You should notice that all these activities have been carried out by the TRIZ team without outside consultants except at the initiation.

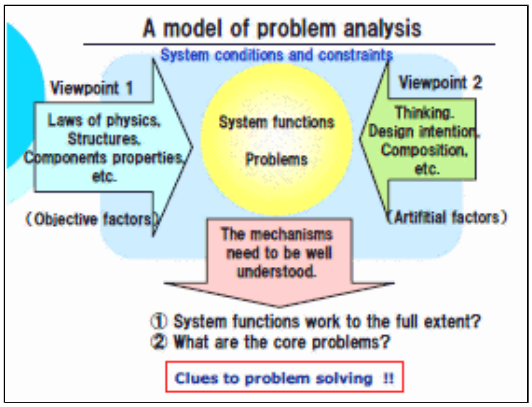


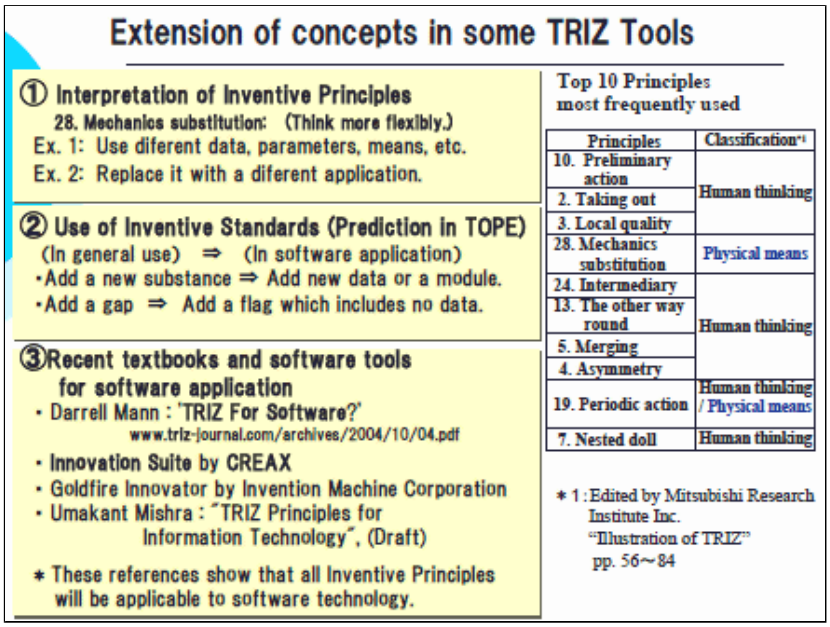


It is remarkable that TRIZ has been used in the real projects in their division, i.e. System Engineering Center, Corporate R&D Division. Their job process is shown in the slide below. Engineers work on project planning and problem definition with the support of TRIZ instructor, and they have to pass the intermediate review by the managers/staff. Then the engineers further work on problem definition and solution generation with the guidance by the TRIZ team and have to pass the final review on the results. Thus the supporting activities of the TRIZ team are always checked and evaluated by many managers and staff in the division so as to fit the organization's policy.

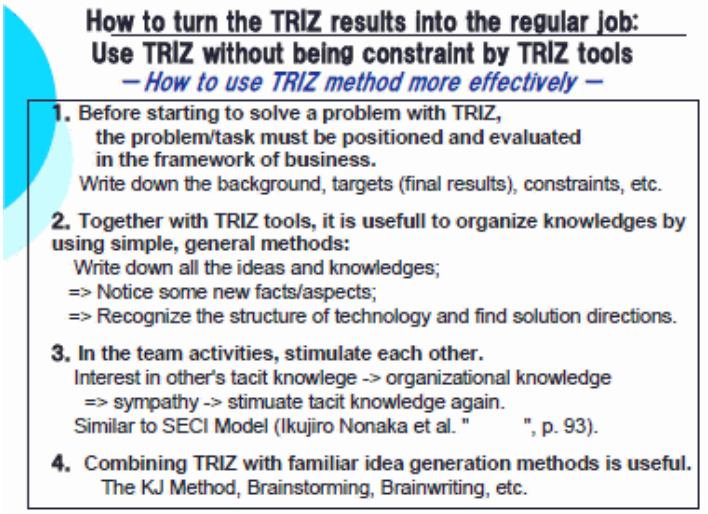


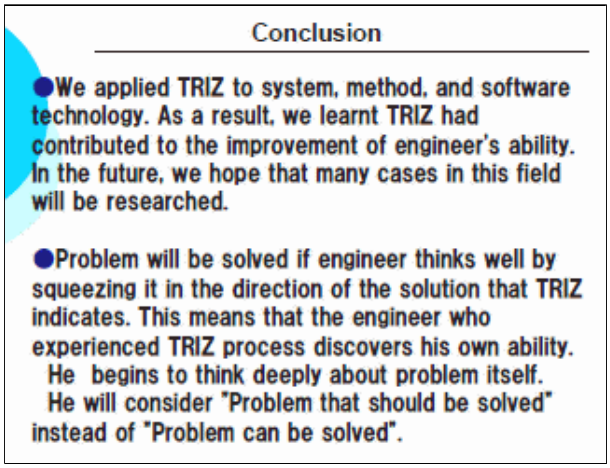
For guiding engineers in these real projects, Yojiro Fukushima shows his model of problem analysis (see left slide). And he also recognizes the needs of extending some of the concepts in TRIZ tools, as summarized in the right slide.





On the basis of these experiences, he summarizes the essence of his learning and concludes as shown below.





*** This presentation is very impressive in the point that they use TRIZ (together with other supporting methods) for supporting engineers to perform their real jobs especially in the initial stages of project planning, problem definition, and solution generation. Such a practical scheme has been developed in the IT/software area where the application of TRIZ is still quite new; this is an amazing achievement.

Please note in the above slide, Fukushima mentions new TRIZ textbooks and software tools in this field. Umakant Mishra's book of "TRIZ Principles for Information Technology" (TIC, Draft edition, Apr. 2007) is now under translation into Japanese (by Nakagawa and SKI); Fukushima's group is the first eager reader of Japanese draft and says they have obtained much confidence in their understanding of TRIZ in IT/software field. On the translation project, please refer to a separate page in this Web site Engl.

The presentation slides of this Invited talk will be posted in the official site of Japan TRIZ Society, and also in my Web site "TRIZ Home Page in Japan".

Masatoshi Hotta (Sozo Kaihatsu Initiative Co., Ltd.) [T-1, I04] was invited to give a Tutorial in the morning of the First Day for the people relatively new to TRIZ. His title was: "**Introduction to Systematic Innovation: For the First Step to Real Use of TRIZ**". The Tutorial was given in Japanese only.

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5. Methodologies in TRIZ

KUROSAWA, Shinsuke (The SANNO Institute of Management) [P-A2 #07] gave a presentation with the title of "**Contemporary Issues of TRIZ to be a Scientific Method**". The Author Mr. Kurosawa is unique in Japanese TRIZ community in his capability of Russian language and also as a thinker in TRIZ. I will quote his Abstract first.

> TRIZ is often considered to be a set of Idea Generation Tools or, in the better cases, a system of Problem Solving Tools. TRIZ, actually, is a new field of human wisdom and eventually has a far broader potential to be a science with a system of knowledge which can be applied to many fields of human activities. However to the author's regret, TRIZ today seems to lack prerequisites to be called a science. The presentation is the author's attempt to bring forward the challenges of TRIZ to become a really big something. The presentation is prepared for the sake of the catalyst to activate discussions over the issues.

He starts the discussion with the definition of the word 'Scientific': "If there is a principle and you can find infinite number of events that correspond with it, the principle is called Scientific. (A definition based on the idea of Martin Heidegger)".

The Author discusses on the following 8 issues:

> Issue 1: The TRIZ fundamental postulates
> Issue 2: Laws of Systems' evolution
> Issue 3: Methodology of studies
> Issue 4: Illusion of a panacea
> Issue 5: Basic tools
> Issues 6: Functional analysis (one of the TRIZ auxiliary tools.)
> Issue 7: Wider needs for TRIZ applications
> Issue 8: TRIZ dissemination

[Note TN, Oct. 25, 2008] I wrote some introduction of the Issues 1-3 quoting his 3 slides. However, the permission of quoting the slides is not given yet by the Author (or its organization). Thus I have to suppress the slides and my explanation at moment.]

*** The Author, Shinsuke Kurosawa, goes further ahead to discuss 5 more issues. The issues discussed here are important and the Author has pointed out good suggestions. Unfortunately, however, the Author chose the Poster presentation where max 16 slides are allowed. We wish that the Author writes a full paper of this presentation and publish/post it in the near future.

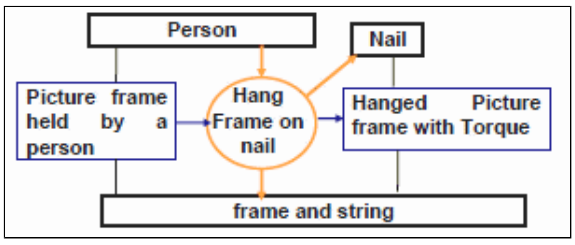
Toshio Takahara ( ) [O-16 #18] gave an oral presentation with the title of "**The General Picture of TRIZ From the Viewpoint of Changing Objects — A Method of Resolving Differences Based on the Concepts of Functions and Process Objects Part 3—**".

The Author, Toshio Takahara, is a retired engineer and a unique self-taught thinker. He has written and presented a series of about 15 papers for these 6 years with a vision to build a general theory which can represent various systems and human activities in a consistent way. It took about 5 years till autumn last year for me to recognize the importance of his works. Last March I dedicated him a section of my Web site "TRIZ Home Page in Japan" to post all his papers. The main page is: "Theory of Resolving Differences" -- A Collection of Papers Written by Toshio Takahara (2003-2007) Engl. I explained his term of 'Resolving Differences' as follows in my Editor's Note:

> By the way, the keyword "Resolving Differences" is probably coined by Mr. Takahara. The gap between the reality and what we want or what should be is called the 'Difference'. Recognition of such Differences and trials of resolving or eliminating them are the fundamentals in human activities. Such human activities take various forms and phases, including goal setting, problem recognition, designing, problem solving, etc. In this sense, "Resolving Differences" covers a wider scope than 'Solving problems' and 'Resolving Contradictions' in TRIZ.

The Author feels difficulty in explaining his large-scale theory in a 30 min. talk. I also feels the same difficulty in writing this brief introduction. I am going to show only two figures here:

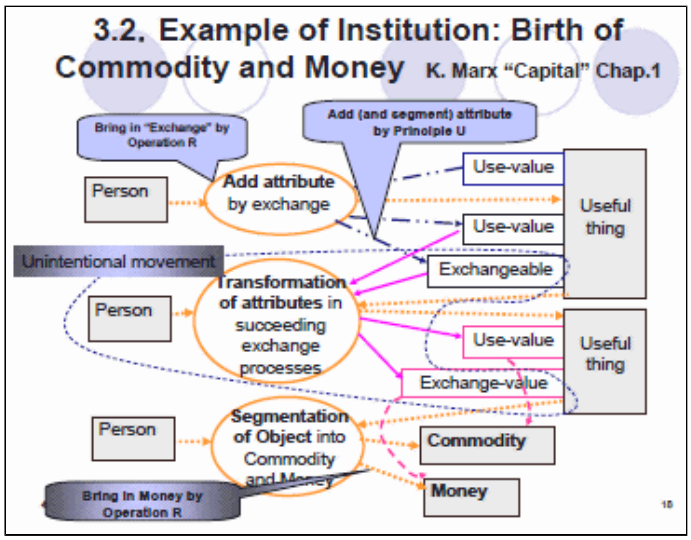
Takahara's graphical representation is very compact and useful to show the functional relationships between objects. The figure in the right shows that a Person hangs a Picture frame on a Nail with a String. The thick boxes stand for Objects, while the thin boxes represent relevant Attributes related to the Objects. The oval represents a Function; the orange arrows connects the Objects involved in this Function, while black arrows connects the Attributes for showing the change as the result of the Function. This is an example of showing a simple technical system.



The Author wants to apply the same graphical method

to the cases of human activities and institution. The figure shown right represents the 'Birth of Commodity and Money' in reference to Karl Marx' "Capital" Chapter 1.

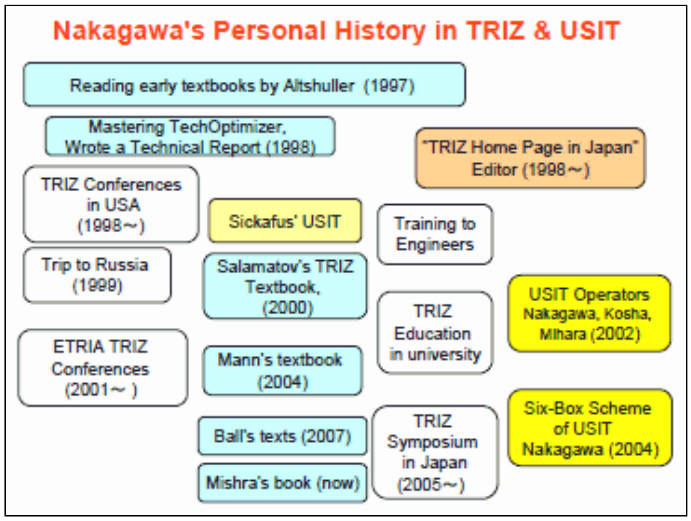
First a Person use a Useful thing for its sake. Then the person finds the thing exchangeable with some other useful things; thus Useful things start to have Exchange-value in addition to their original Use-value. Then the segmentation of Object into Commodity and Money is introduced as a social institution. Commodity has the Use-value, while Money has the Exchange-value.



*** The graphical representation methods by Toshio Takahara are nice entrance to his theory. If you are interested in them, please refer to his original papers in the Collection or in this Symposium. The slides and the full paper will appear in my Web site in near future.

Toru Nakagawa (Osaka Gakuin University) [O-4 #45] gave an oral presentation with the title of "**Extension of USIT in Japan - A New Paradigm for Creative Problem Solving -**". Since I already posted my presentation Eng, Jap, both the full paper E PDF J PDF and the presentation slides E PDF J PDF, in this "TRIZ Home Page in Japan", I would like to show you only three slides here.

First I would like to show you my personal history of studying/applying/teaching/promoting TRIZ and USIT. As you may already know in this Web site, I have tried to learn various aspects of TRIZ through books (especially by translating them into Japanese), conferences, teaching, training engineers, etc., and wrote a large number of papers and articles all of which were posted in this Web site. All these are my trials to understand and 'digest' TRIZ for the purpose of real use and teaching. Through these activities, I have found and chosen USIT as the principal methodology and problem solving procedure which I would recommend to people and promote the development.

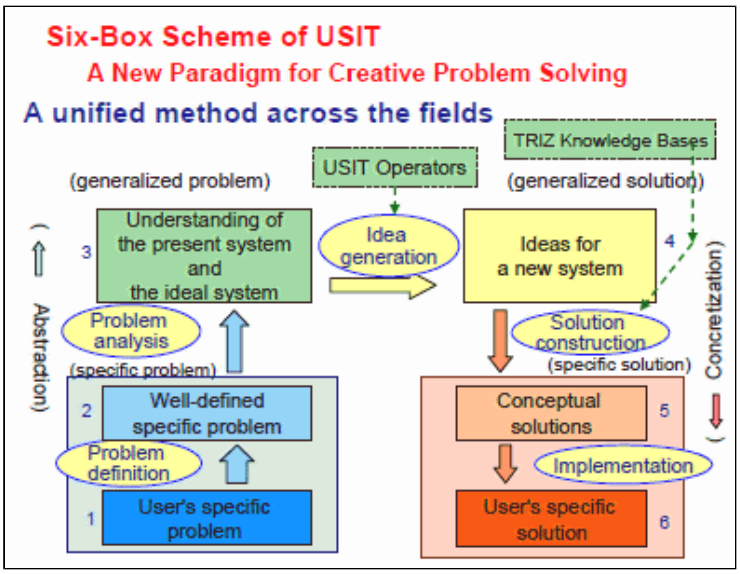


This slide shows the outline of my talk. Since the initial stage of introducing TRIZ in Japan around 1997, we have tried our best to understand TRIZ in its essence. Understanding TRIZ in an easier and unified way is my (and our) motive; and hence I have chosen USIT.

The introduction and extension of USIT in Japan is explained here in three main steps. First is the introduction of USIT as developed by Ed Sickafus. Then, through our experiences of applying USIT, we found it necessary to make the solution generation methods easier and more effective. Thus we reorganized various methods of solution generation in TRIZ into the new system of USIT Operators.

The third step was achieved when I draw the USIT procedure in a data-flow diagram. The

whole procedure gives the Six-Box Scheme (see the slide right). This scheme has significant difference from the orthodox Four- Box Scheme. Understanding of the present system and the ideal system is the target of the problem analysis. Ideas for a new system need to be obtained next, in the idea generation. Then around these ideas conceptual solutions have to be constructed. The new Six-Box Scheme seems surprisingly natural and does not require analogical thinking. It is now recognized as a New Paradigm for Creative Problem Solving.

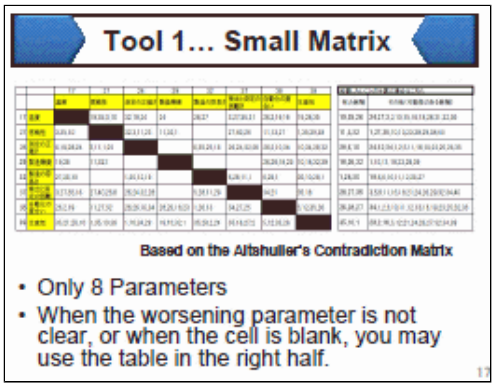


*** On my request, Dr. Ed Sickafus, the original developer of USIT, gave me his comments on my paper. His Comments are very suggestive. See the page: Engl

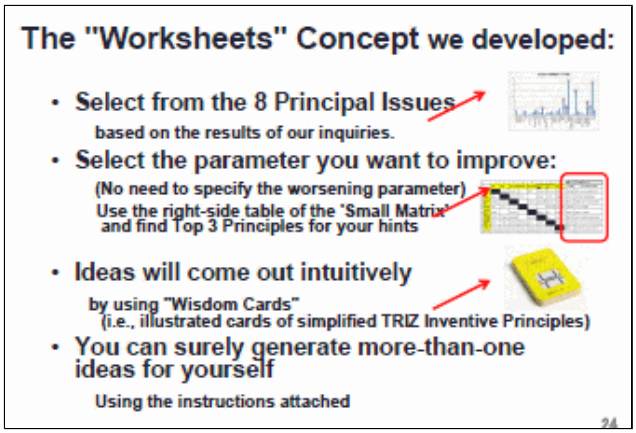
*** My paper will also appear in the TRIZ Journal, Nov. 2008 Engl. And also in the Web site operated by Umakant Mishra Engl.

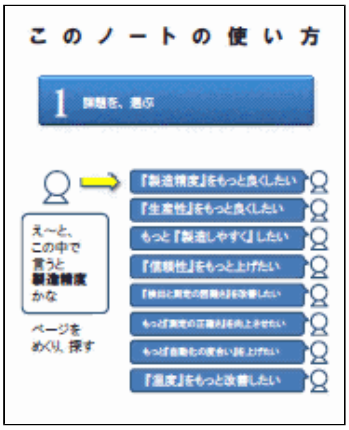
Rikie Ishii (Dunamis Co., Ltd.) [Miyagi TRIZ Study Group] [O-9 #38] gave an oral presentation with the title of "**How to Use TRIZ Quickly and Effectively in Small Companies**". The Author is an active young entrepreneur-oriented person and is organizing a group of people in Sendai City, Miyagi Prefecture, for studying and promoting TRIZ. The Group sent enquiries to over 1000 SMEs in Miyagi Prefecture. They found: (1) 39 TRIZ Parameters are useful as the tool for hearing the technical issues/problems. (2) Technical issues are mostly relevant to 8 Parameters. (3) Among the 31 Trends of technical evolution, most companies recognizes only top 1/3 trends are relevant to their products. On the basis of these findings, the Author has developed the following three handy tools:

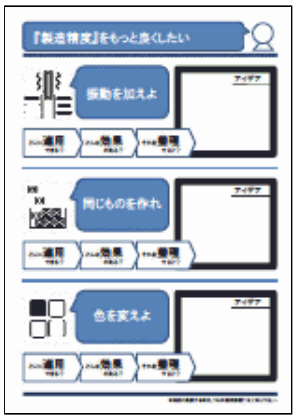
Their first tool is a small (8x8) Contradiction Matrix. Since only 8 Parameters are found most relevant, the Matrix was much reduced into 8x8. The 8 Parameters are: Temperature, Reliability, Precision of measurement, Manufacturability, Difficulty of detection and measurement, Degree of automation, and Productivity.



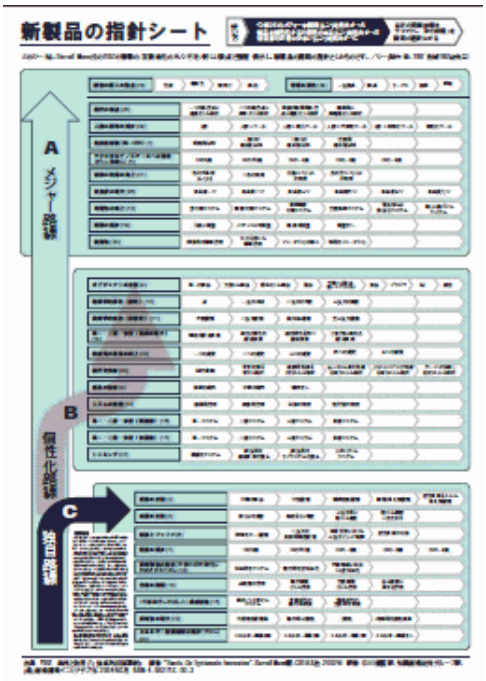
Their second tool is named 'Worksheets for Technical Breakthroughs'. Its concepts are described in the slide below. The center figure shows its page for guiding the user to the 8 pages corresponding to the 8 often used Parameters. The right figure illustrates the page for one of the 8 Parameters, where 3 Inventive Principles are shown as the hints.







Their third tool is the 'Guiding Sheet for New Product Development'. This is based on the findings about the 31 Trends that most companies recognize well top 10 Trends while not at all the bottom 9 Trends. Thus, as the guide for planning the development of new products, the 31 Trends are suggested to be considered one by one in three groups. The top 10 Trends are shown as the Major routes on which companies always have to think . The middle 11 Trends are named Customizing routes, whereas the bottom 9 Trends the Unique routes. For each Trend the stages of evolution are shown by keywords.



*** The Author's approach is unique in the application of TRIZ knowledge and in deriving their own tools. As you see the Author's Group has a special talent in designing the pages, cards, tools, etc. Their tools have attracted much interests of participants in the TRIZ Symposium this year as well as last year. See the Web site of Miyagi TRIZ Study Group (Mi-TRIZ) .

TRIZ Spreading/Use Study Group of Japan VE Association Kansai Branch: Masayuki Ishii (Sumitomo Electric Industries, Ltd.), Nobuhide Matsuda (Matsushita Electric Industrial Co., Ltd), Kazuyasu Ikeda (Sekisui Engineering Co., Ltd), Makoto Unno (Kawasaki Heavy Industries, Ltd) [O-13 #15] gave an oral presentation with the title of "**Study of Development-type TRIZ tool (part 2)**". This Study Group is a voluntary group of about 25 members coming from various industries. They are originally based in the Kansai Area, i.e. Osaka, Kyoto, Kobe, etc., but now based in a wider area, e.g. Nagoya, Hiroshima, Fukuoka, etc. They have been operating monthly one-day discussion meetings for these 5 years. Intention of the Group may be clear in the Abstract of their last-year presentation:

> In Japan VE Association's Kansai Branch, we got interested in the TRIZ technique as a new means of value-adding creation within the VE procedure. Thus in 2003 we established "TRIZ Spreading/Use Study Group". With the aim at studying and penetrating the integrated use of VE and TRIZ, we have examined to perform various kinds of individual TRIZ tools. Starting in 2006, we have launched a case study project for the purpose of establishing and improving an efficient and integrated problem-solving procedure.

Their current activities of the TRIZ Case Study Project are overviewed in the slide (see right). They want to find effective ways of applying TRIZ for developing a new product. Since all the members are TRIZ leaders in their own companies (and no consultants), during the Group meetings they make a lot of discussions on how to use various TRIZ tools, they say.

TRIZ Case Study Project : Overview

Purposes and Approaches

Purposes	1) To share TRIZ concepts	For deep understanding
	2) To actually use various tools	For practical experiences, For guidelines and manuals
	3) To generate solution ideas	For a wide range of ideas
Approaches	1) Divide the Group into two Teams, A and B 2) Set 2 sub-tasks and the two Teams work on each of them. 3) One member is delegated as the team leader in each team. The team leader instructs to the team the tool to apply. Then, the team make group practice on their subject.	

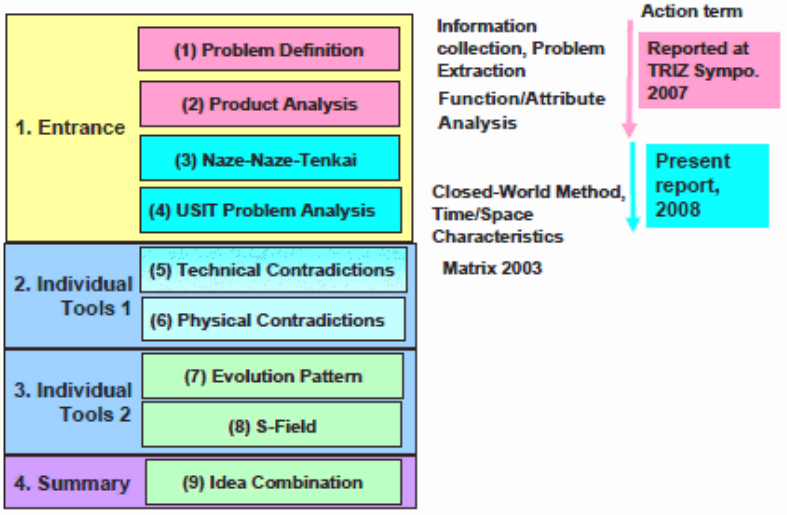
Subject for study

Subject	To allow all members to participate in the discussion, "Domestic vacuum cleaner" was selected as a common subject.
Situation set-up	The members are supposed to be engineers in a development division of an electric appliance manufacturer. In response to a request from the sales division and planning division, we started to develop an improved model.

By using a theme of 'Developing a new, improved model of domestic vacuum cleaner', they are trying to study various procedures and tools in a comparative way. Their plan is shown in the slide (see right).

The topic of the present report is (3) Naze Naze Tenkai (i.e. Root cause analysis by asking why? why? ...) and (4) USIT Problem Analysis.

2. Comparative study of problem solving approaches and tools



Since we do not have much space here, I would like to show you their findings in the slide (see right).

*** The steady activities of this Group is amazing. The Group serves much to stimulate, encourage, and promote TRIZ activities in a large number of members' companies.

3. New Findings

We reported on the 'Naze-Naze Tenkai' last year, and on 'USIT Problem Analysis method' this year. We have found the following points in conclusion.

◆Both tools have their own merits. Thus, it seems appropriate to use both of them together for understanding the root causes properly.

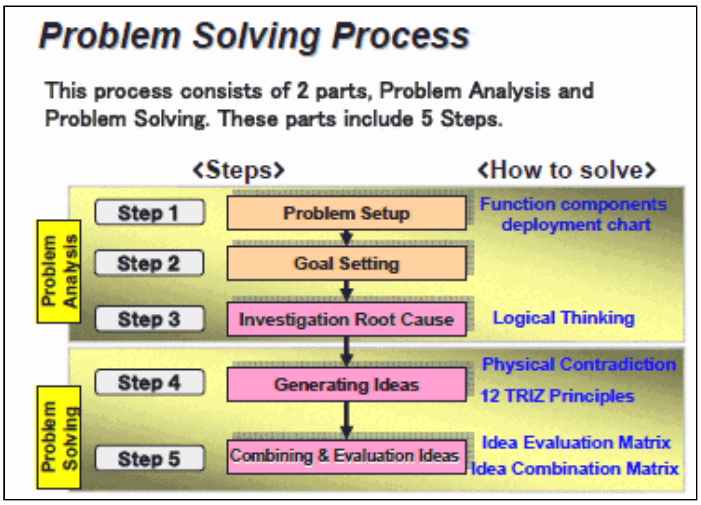
◆ USIT has several tools from problem definition to solution generation. We have understood that those USIT tools are smoothly connected with one another to derive the solutions as the whole procedure.

◆We have realized that when we want to have drastic solutions to complicated problems, we should closely analyze the space and time characteristics of the problem mechanism and the attributes related to the problem, and that the tools we studied are effective for these analyses.

Creativity Study Group: Hiroto Hayashi (IWEL Co. / Iteq International Co.), Nobuhide Matsuda (Matsushita Electric Industrial Co., Ltd.), Hiroshi Kamijyo (Iteq International Co. / IWEL Co.) [O-15 #36] gave an oral presentation with the title of "**Idea Process using only 12 Principles**". The same Group made two more Poster presentations. They are: H. Kamijyo, N. Matsuda, and H. Hayashi [P-B5 #37] on "**Idea Process using only 12 Principles: Function Components Deployment and Find Primary Cause**"; and N. Matsuda, H. Kamijyo, H. Hayashi [P-C5 #33] on "**Creative Problem Solving Process Where We Use Only 12 TRIZ Principles: Generating Ideas and Combining Ideas**".

This Study Group has also about 25 voluntary members coming from different industries. The Group was formed spontaneously in 2006 by the users (or clients) of consultants, Mr. Hiroto Hayashi and Mr. Hiroshi Kamijo. They had meetings once a month, from 10:00 to 17:00 on Saturdays, and made group practices of TRIZ together. Most of the members are located near Osaka, but some come from Tokyo, Nagoya, Hiroshima, and Fukuoka (with their private money). Several active members in this Group are also the members of the TRIZ Study Group in the Japan VE Association mentioned above. I did not know about this group until recently when I was asked to review the drafts of their new TRIZ textbook (published in May 2008). Their motive is to make TRIZ easy and yet effective to apply real problems.

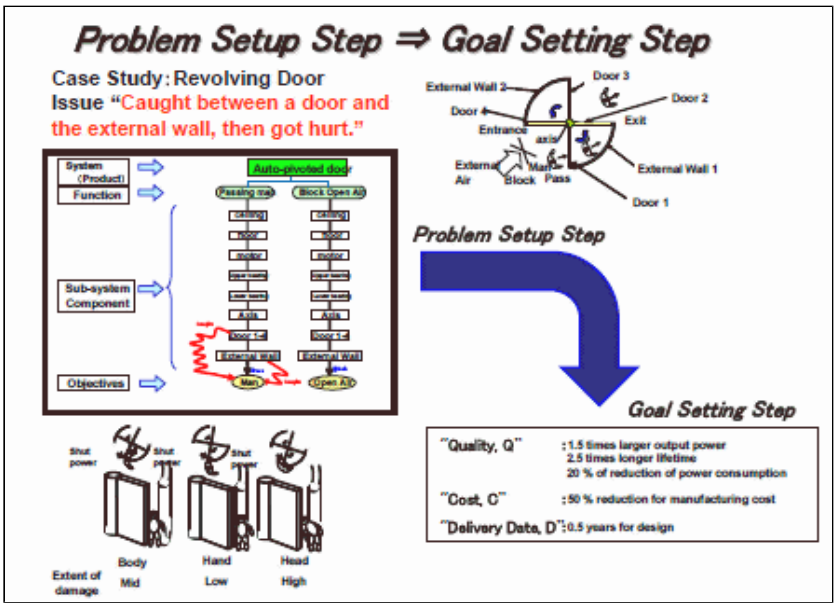
The problem solving process they have established and published in the textbook is outlined in the slide (see right). The process consists of two parts, i.e. Problem analysis and Problem solving. The Authors presented these steps in detail by using the whole process of a case study.



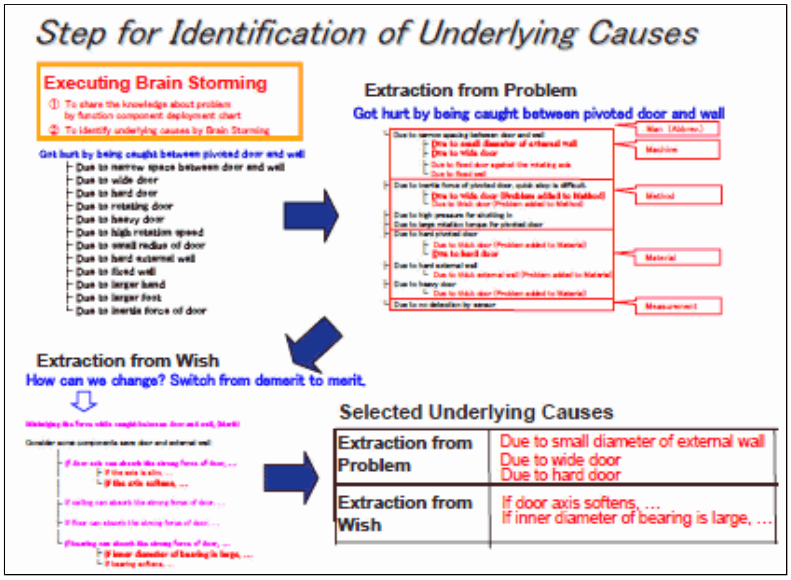
Their case study is the safety problem of a revolving door. About a year ago we heard sad news that a child was caught between a revolving door and the external wall, and was killed.

The first step is to set up the problem. After setting the problem they discuss the problem in various angles. They draw sketches of the problem situations, to understand the space and time relationships, to understand the functions of components of the system, and (particularly in this problem) degrees of injuries in various cases.

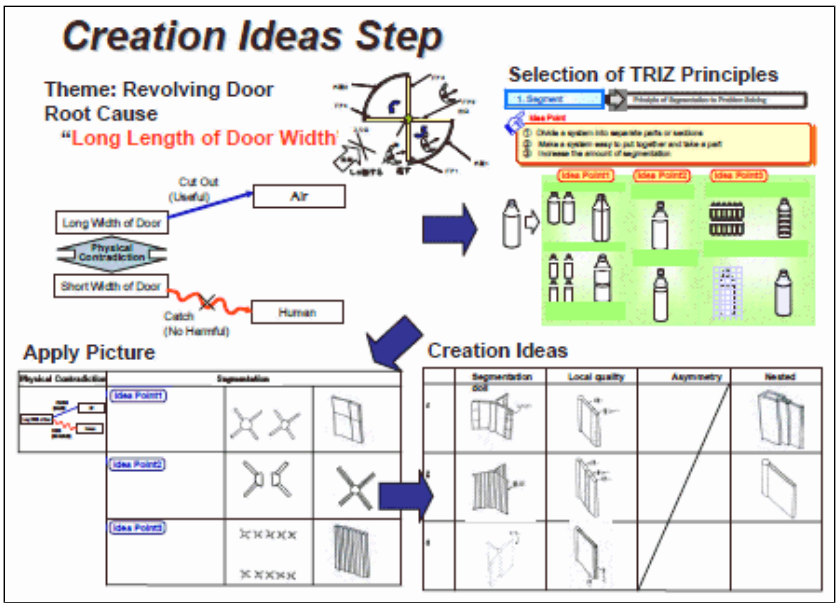
On these bases, they go ahead to set up the Goal of this case study.



Next step is to reveal the underlying causes. Their method here is called "Naze Naze Tenkai" in Japanese ("Why, Why Deployment", or "Root Cause Analysis"). Here shows its detailed process, i.e., executing Brain Storming of the causes, extracting causes further from the view point of problem, and from the view point of wishes, then finally selecting the most significant one.

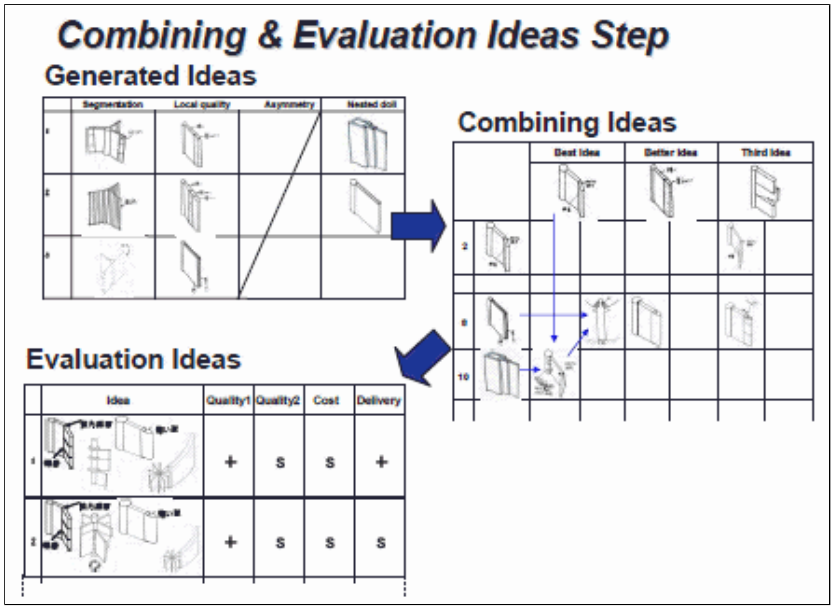


In the step of Idea generation, the logic of ARIZ is used to select TRIZ Principles to be used as suggestions. The Study Group selected only 12 Inventive Principles which are most often used. They use a picture book containing a lot of illustrated examples of applying these 12 Principles. Thus they generate a large number of ideas and draw their sketches.

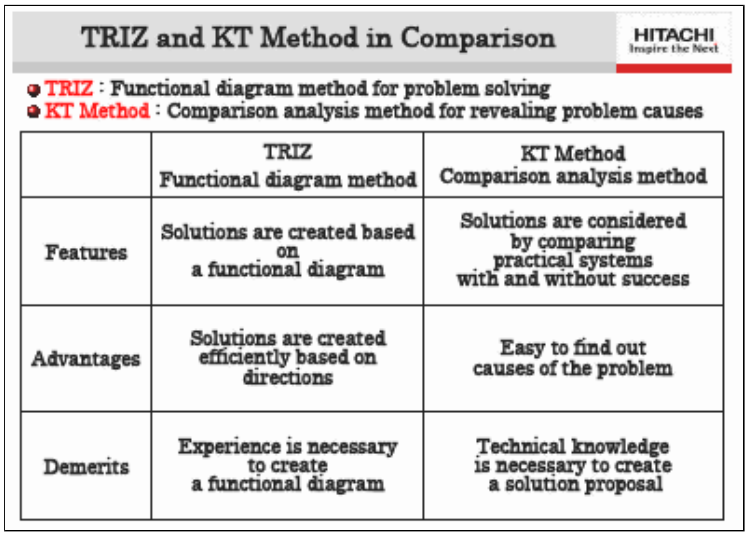


In the next step they further try to combine ideas and then to evaluate the ideas from several view points of Quality, Cost, and Delivery.

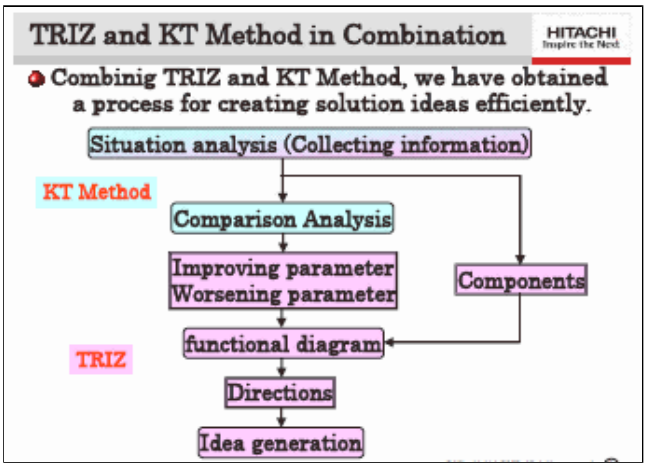
This Study Group has already established the whole process of problem solving as described here, and is trying to apply it to different problems in order to refine the method.



Satoshi Okada and Setsuo Arita (Hitachi Ltd.) [P-C6 #48] gave a Poster presentation with the title of "**Combined Use of the KT Method in Functional Modeling and the TRIZ Method in Idea Generation**". KT Method stands for 'Kepner-Tregoe Method'. The Authors' logic and results are clear in their two slides shown below:

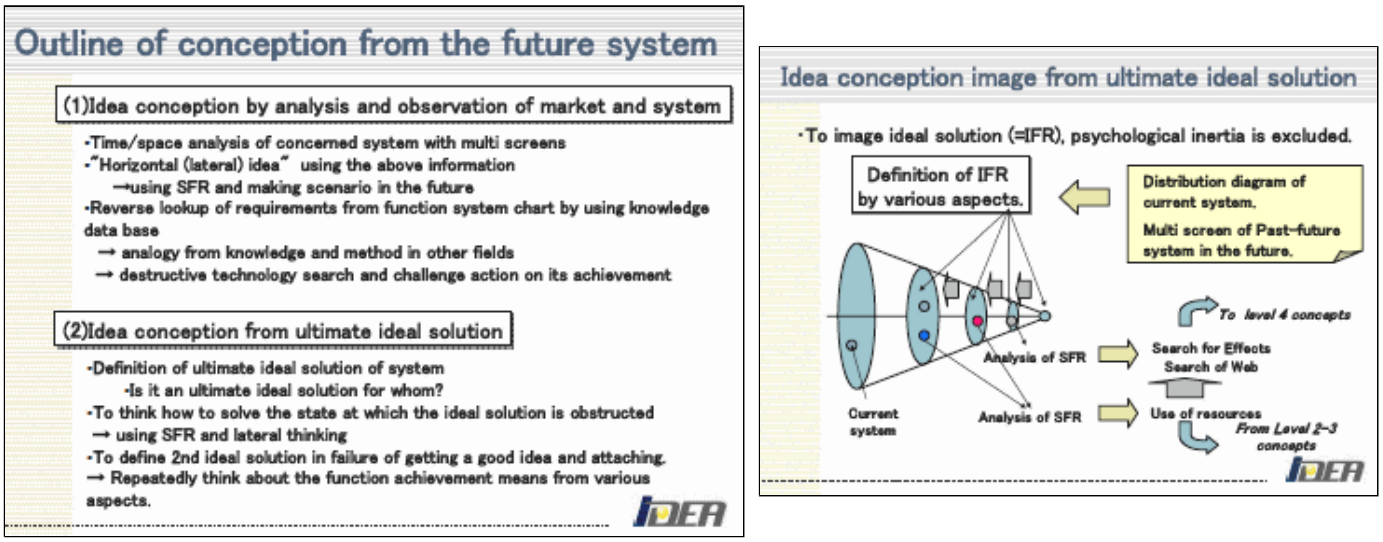


	TRIZ Functional diagram method	KT Method Comparison analysis method
Features	Solutions are created based on a functional diagram	Solutions are considered by comparing practical systems with and without success
Advantages	Solutions are created efficiently based on directions	Easy to find out causes of the problem
Demerits	Experience is necessary to create a functional diagram	Technical knowledge is necessary to create a solution proposal



Masahiro Kuwahara (IDEA Ltd.) [O-11 #03] gave an Oral presentation with the title of "**A Concrete Method for Idea Conception from Systems in the Future**". By using a case study of electric shaver as an example, he explains his way of thinking of Ideal systems and using S-curve analysis. 2 of 4 slides published in English are quoted

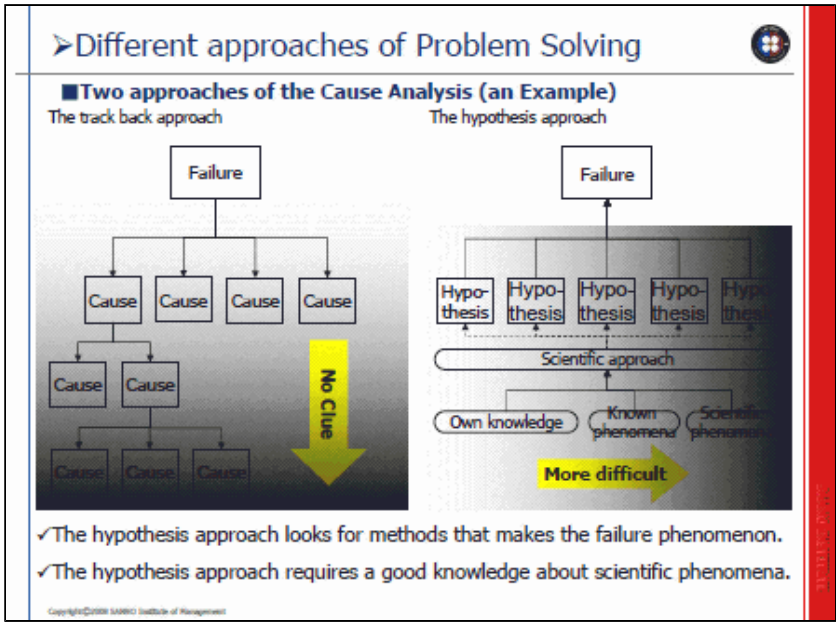
below without explanation:



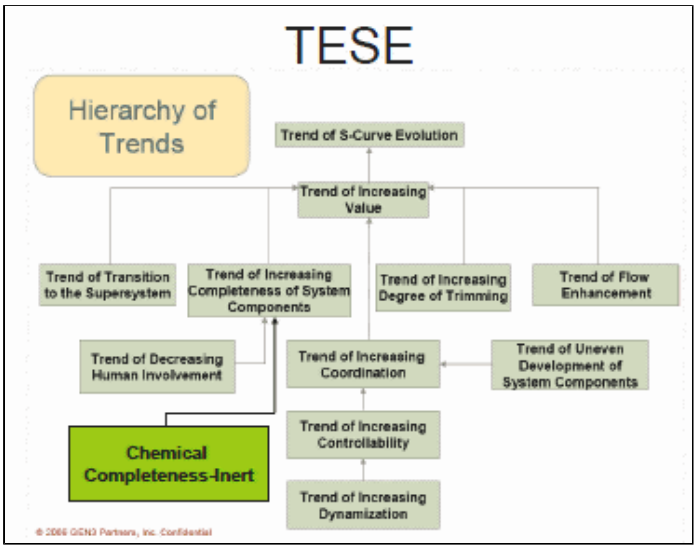
Masaya Takemura (The SANNO Institute of Management) [O-19 #06] gave an Oral presentation on "**Application of TRIZ to Production and Process Technology**". His main topic is the TRIZ/FA (Failure Analysis), or sometimes called as subversion analysis. I will quote the Author's Abstract:

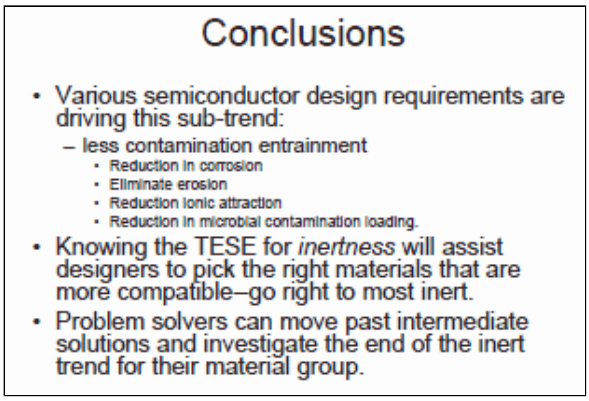
> In this country, TRIZ is used mostly by R&D engineers. However, users of TRIZ should not be limited to engineers in R&D. It is known by the fact that classical cases used for TRIZ education cover widest variety of technological fields. Author believes that more efforts shall be made in order that TRIZ is used in wider scenes of technological development.
> The paper is written on the basis of the author experiences of problem solving by application of TRIZ to problems in fields of production and process technology in production of industrial materials. The author discusses here how TRIZ 1) guided engineers to find and define problems properly, 2) problem solving from inadequate information 3) shortened the time for problem solving and 4) enhanced assessment of effects of the problem solving. In conclusion the author proposes approaches to introduce TRIZ into the fields of production and process technology.

The following slide (among only 4 English slides) is interesting and self-explanatory.



Stephen Wagner (Intel, USA) [P-C7 #50] gave a Poster presentation on "**Extension of the S Curve Trends: Increasing Completeness for each chemical system component towards inertness**". The Author's proposal of a new (sub-)Trend is shown in the slide at the left, and his conclusions in the slide at the right.

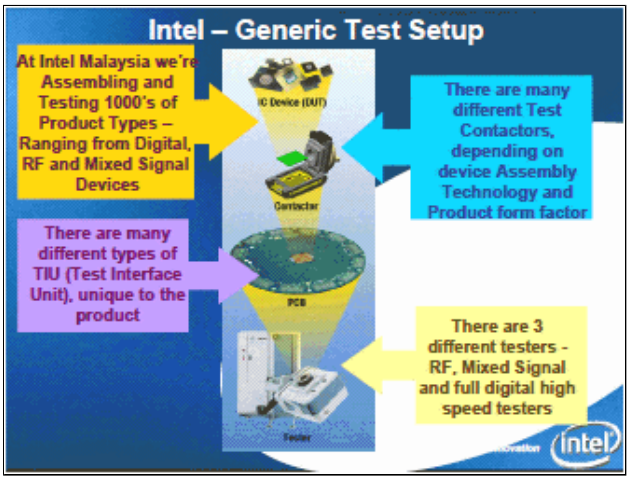




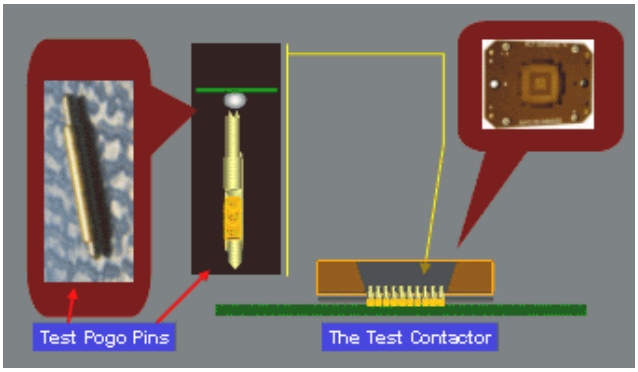
6. Case Studies in Industries

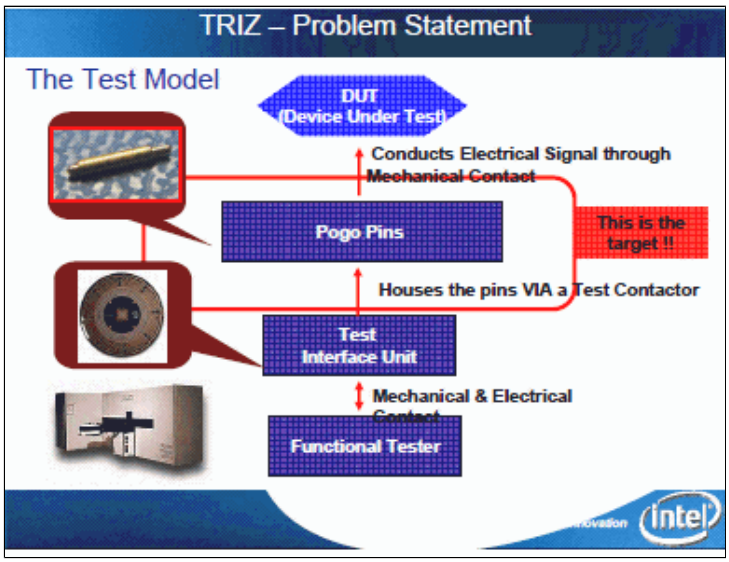
A large number of case studies in the industries (or in the field of technologies) have been reported in the TRIZ Symposium. This has been one of the good traditions in our Symposia and is improved further this year. I will introduce you first the three case studies presented by Intel Malaysia, and then nearly 10 more presented by Japanese engineers.

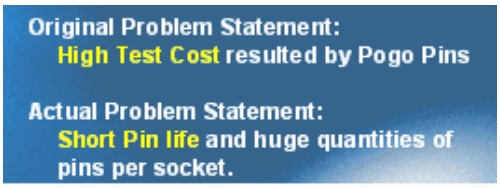
Paul Devaraj and Si, Wai Chiang (Intel, Malaysia) [O-2 #02] gave an Oral presentation with the title of "**Test Pogo Pins (Gold Pins) Reuse Program**". (Due to double tracks, I missed this presentation.) The factory at Penang City in Malaysia is dedicated to testing. The general background of their jobs is shown in the following two slides.



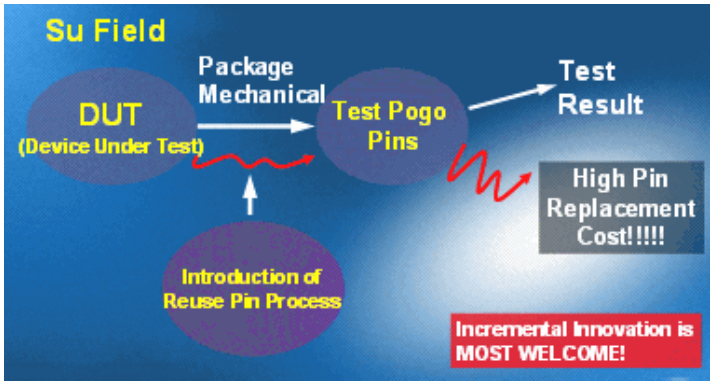
The specific problem addressed in this presentation is shown below. The problem, originally stated as the high test cost due to Pogo pins (made of gold for good electrical contact), is focused on 'short pin life and huge quantities of pins per socket'.



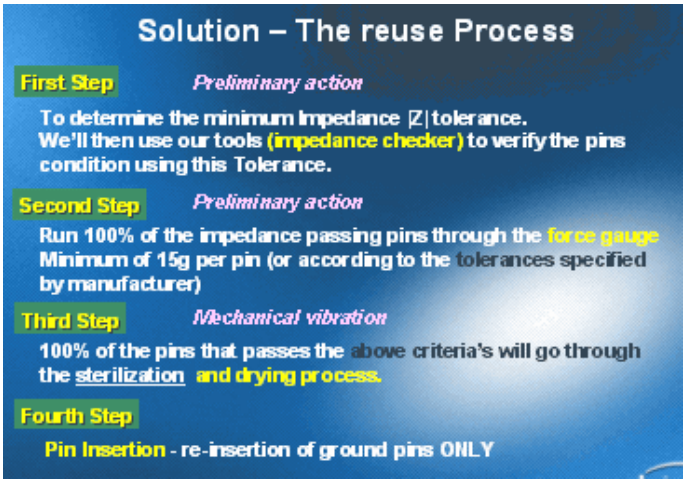




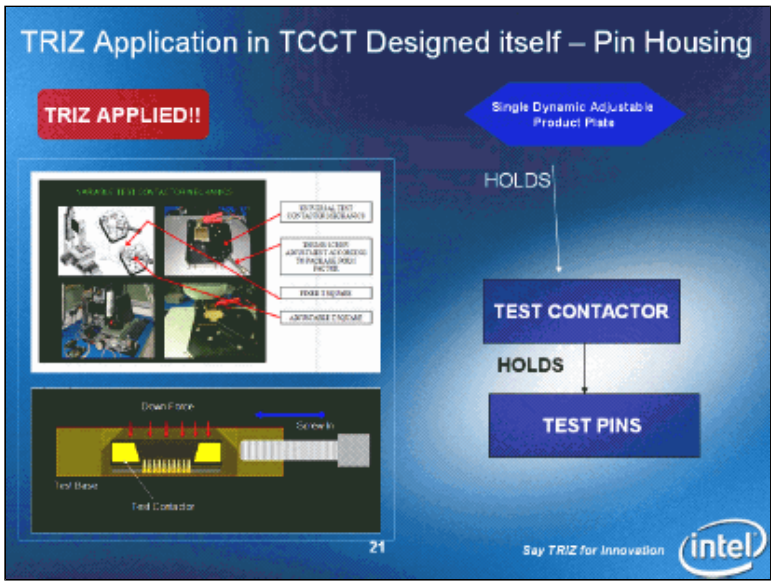
The use of Su-Field Model has suggested the basic direction of solution as shown in the slide (see right). The current problem is the High pin replacement cost. The basic direction which the Authors have chosen is to introduce a Reuse Pin Process, which should reduce the pin replacement cost. We should note the Authors' comment written as "Incremental Innovation is MOST WELCOME!".



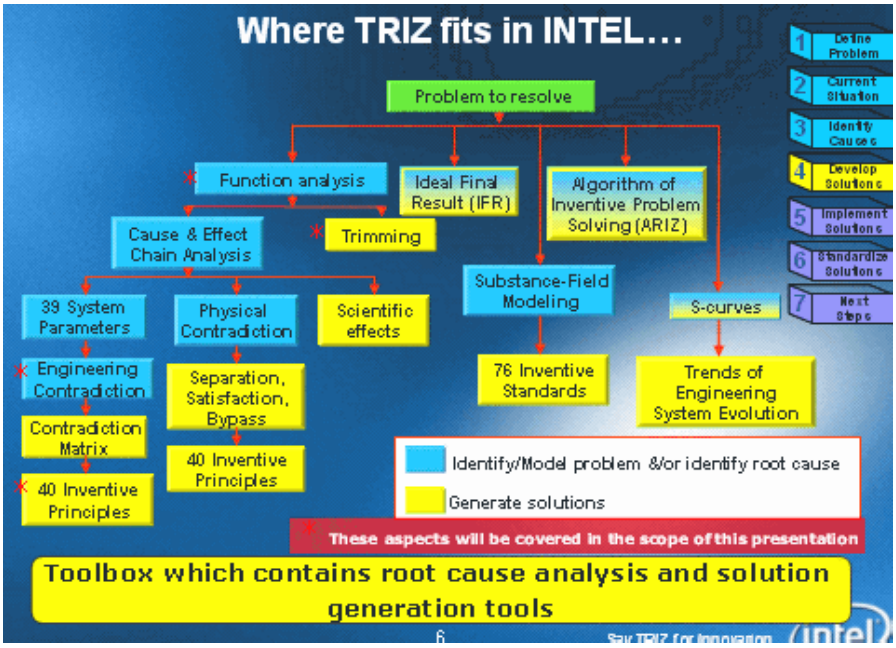
In this direction, the Authors generated a solution concept of the Reuse Process consisted of 4 steps (see below left), then further revised the solution process by merging the first and the second steps. Thus they obtained an idea to make their original tool for this process, named 'Test Contractor Characterization Tool (TCCT)'.



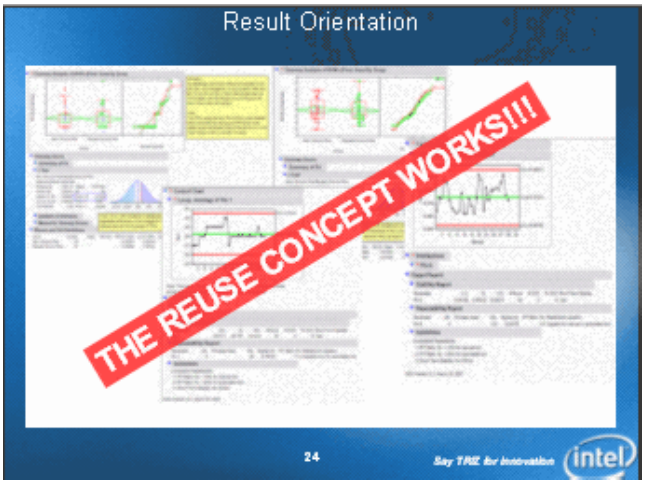
Thus the Authors designed their original in-company tool, TCCT. And in designing TCCT they have applied TRIZ again in various points. One of their TRIZ applications is shown here. Since there are a number of different types of Test Contactors, the product plate to hold the test contactor need to be different and replaceable at first thought. But the TRIZ principle Universality suggested to make the Product plate universally adjustable, as shown in the slide.

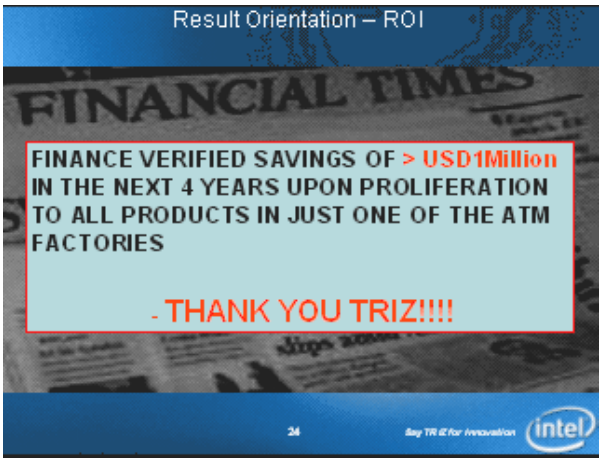


The Authors show the tools of TRIZ used in Intel in the slide. The asterisks * are the specific tools in the present case study. You see that all these tools are standard ones in TRIZ. People in Intel seem to utilize these orthodox TRIZ tools for solving problems in their real jobs.



The Authors conclude their presentation with the evaluation of their results in terms of the business benefits obtained (or to be obtained).

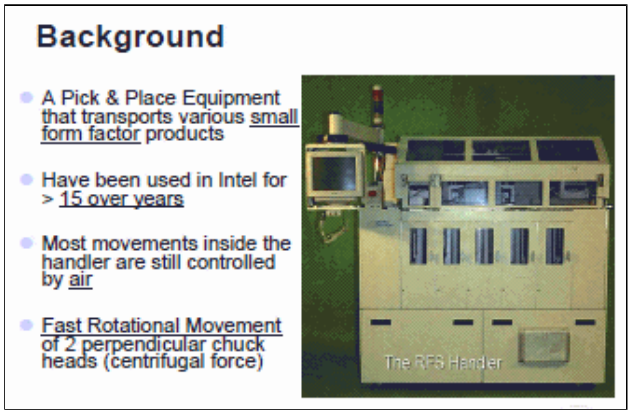


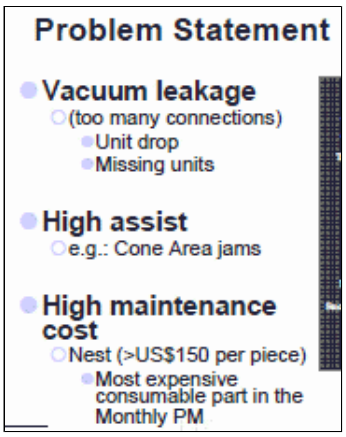


Darin Moreira; Goh Cheng Teik; Azir bin Romli (Intel Microelectronics, Malaysia) [O-18 #04] gave an Oral presentation with the title of "**RFS Handler Cone Chuck Simplification for effective handling performance**". (I missed this presentation, due to double tracks.)

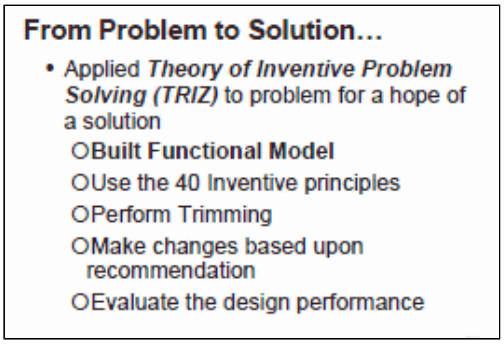
The background of the problem is described below. The RFS Handler is the equipment shown in the picture. It

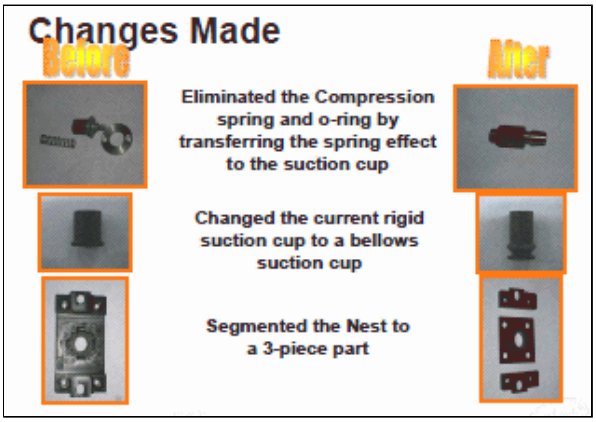
has a component, Cone Chuck, to pick up various small product by using the suction force with vacuum. But the cone chuck often has vacuum leakage and needs a lot of maintenance, as stated in the right column.

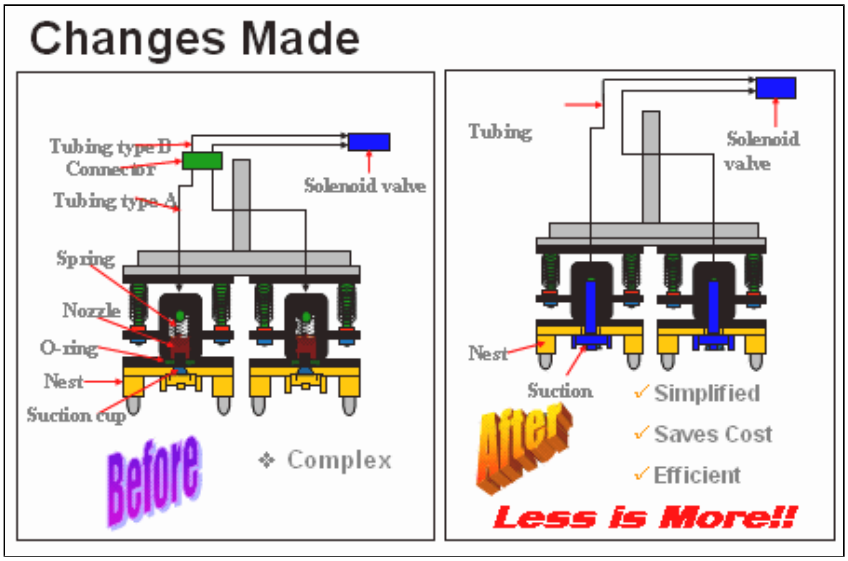




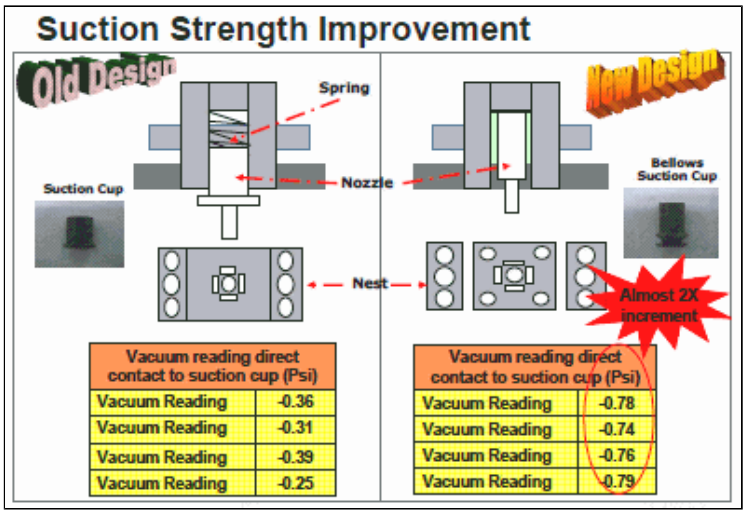
TRIZ has been applied to this problem in a standard manner, as shown in the slide below (sorry but I skip the details of deriving solutions because of the lack of space). The changes finally made in the design of the RFS Cone Check are shown in the following two slides.

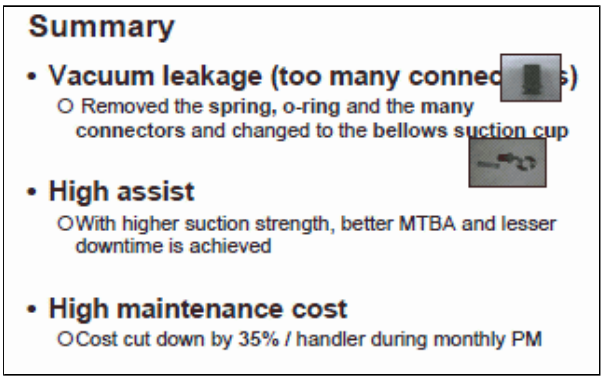




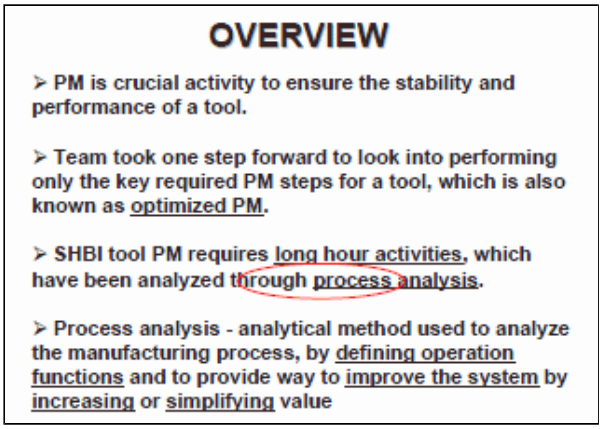


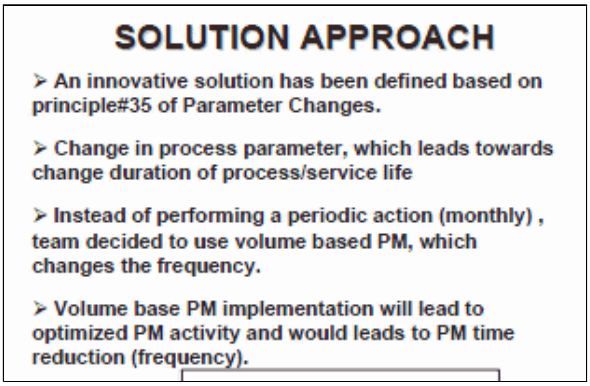
The results of these changes have been confirmed as shown below. The last slide summarizes the solutions and their effects corresponding to each of the problems. "An overall ROI estimate savings of approx USD$800K in the next 4 years", the paper says.

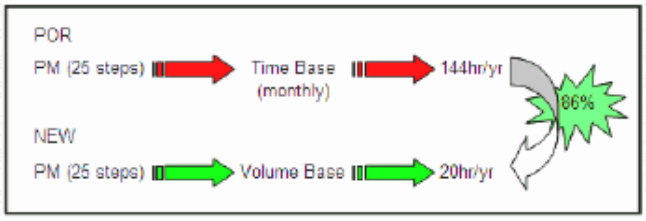




Nagappan Annamalai, Subramaniam Muthukarappan, Nitin Dhansukhlal (Intel, Malaysia) [P-B1 #16] gave a Poster presentation with the title of "**Discovery of An Innovative Process Analysis In Preventive Maintenance Optimization.**" Here I will show the three slides of the overview, the solution approach, and the results. Even though this work seems to have achieved a good result, the descriptions in the slides are rather abstract and not clear to me unfortunately.







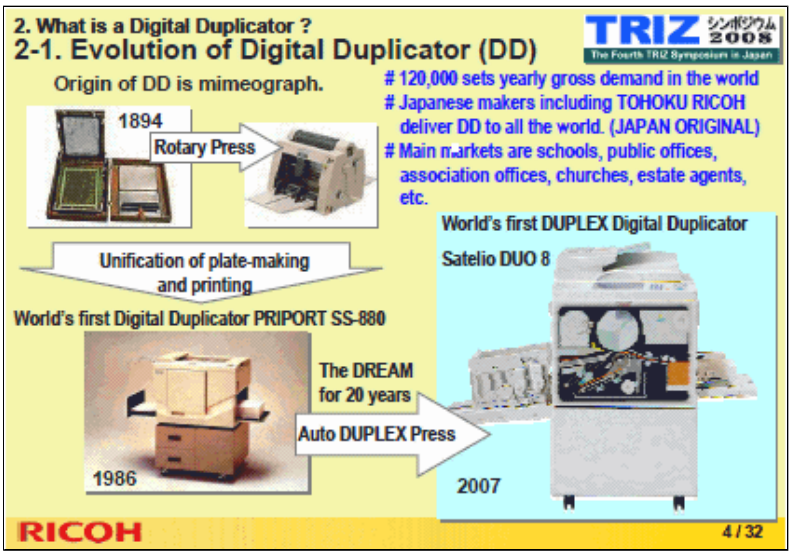
*** These presentations from Intel are very nice as real cases of applying TRIZ to their jobs. We are grateful to the Authors and Intel Corporation for presenting their results openly.

Now I would like to introduce you Industrial TRIZ Applications achieved in Japan.

Hiroshi Kanno (Tohoku RICOH Co., Ltd.) [O-5 #08] gave an excellent oral presentation with the title of "**Usage of TRIZ and USIT in Developing a Novel Duplex Printing Machine**". The Digital Duplicator, RICOH Satelio Duo 8, was developed in this project with the help of TRIZ and USIT and sent to the Market in March 2007 and obtained very high evaluation from the market as a 'long dreamt product'. The Author's 32 slides contain rich information; I would like to show you 14 of them for you to follow his thinking process and to understand the significance. [The full set will be posted in due course in this Web site.]

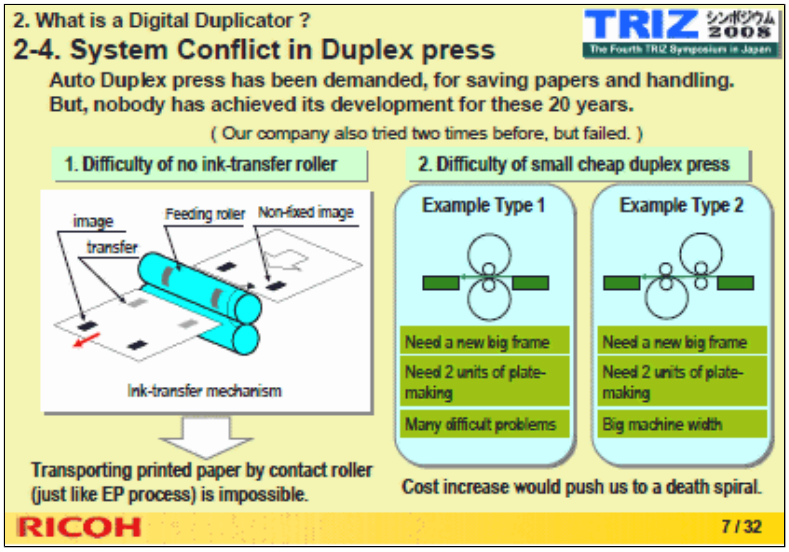
The first slide explains the history of digital duplicator. Its origin is mimeograph invented in 1894 in Japan. Digital Duplicator is its new version where the print master is produced in the machine from the

original copy. The dream for 20 years was to invent a Digital Duplicator which can print on the both sides of paper automatically. This was achieved by Tohoku Ricoh, as reported in the present paper.



This slide shows why the duplex press is difficult in the scheme of mimeography. Mimeography does not have any image fixing process. The emulsion ink is just allowed to penetrate into the paper and get dry in time ('pseudo-drying'). Thus, just after printing on a side of paper, the ink is likely to transfer to the roller (and other components) when pressed to print on the other side.

The second difficulty shown in the slides is the need of two units of printing, causing much cost.

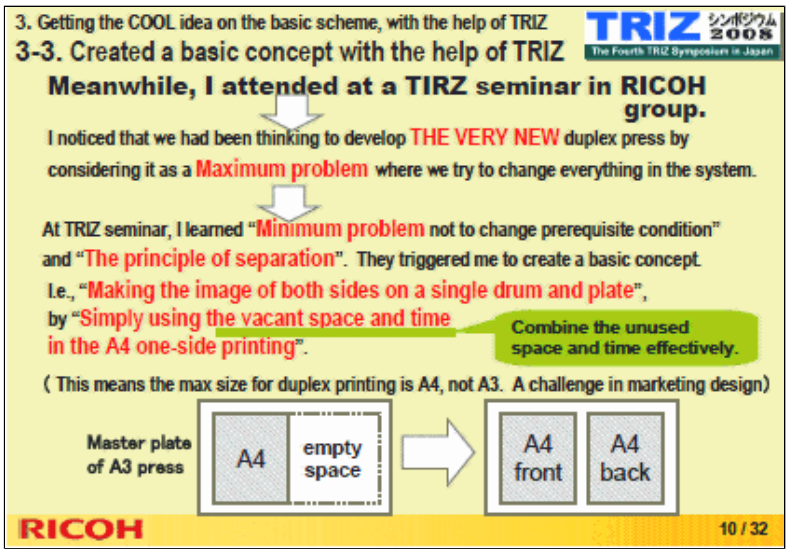


The Author's company tried to develop a duplex printer two times beforehand, but failed. The Author describes the start of the present project as follows (for saving space, I am quoting his texts skipping figures etc.):

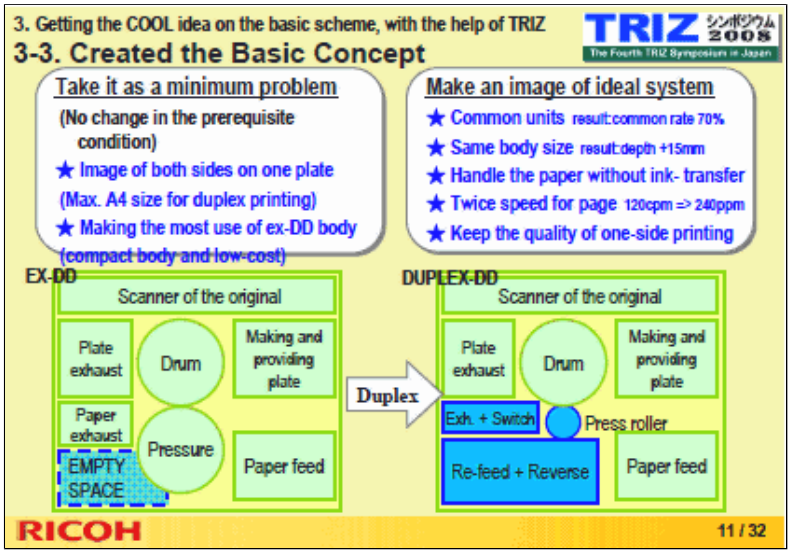
- In 2001, we re-started the development of duplex press, for realizing the dream. First, for learning from previous lessons, we investigated the known mechanisms of duplex press thoroughly and surveyed the world patents.
- Thus we made a patent-map of duplex press in mimeograph. [137 contents]
- We classified them into 42 patterns of duplex press methods and analyzed them.
- Then, we thought over BASIC CONCEPTS and SCHEMES of DREAM duplex press.
- But because of some interrupts, the development was suspended. (AGEING TIME)

Then, meanwhile, the Author attended at a TRIZ seminar in RICOH group. (Since around 1997, several pioneering engineers in RICOH have been working to introduce TRIZ (in various forms including USIT). They have organized TRIZ Study Group, have been teaching TRIZ in training seminars, and have been supporting engineers in their real projects, etc.)

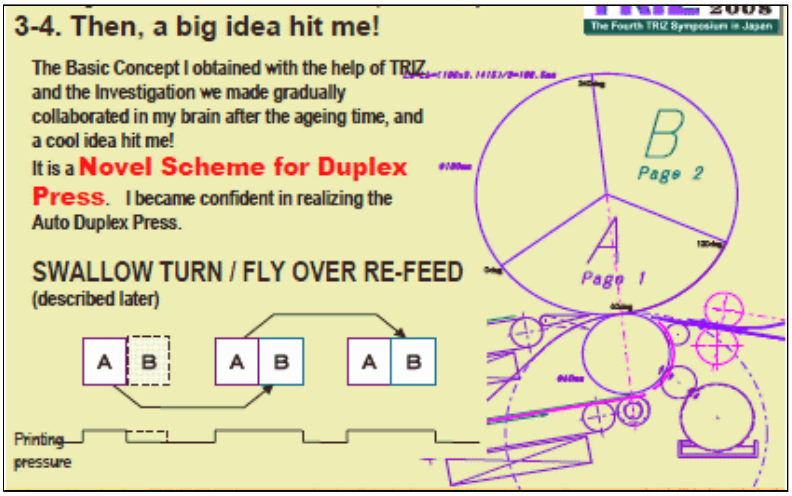
The very basic approach of TRIZ seems to have given the Author new directions of thinking. TRIZ concepts of Minimum problem, vacant space and time as the Resource, and the Separation Principle have stimulated his thoughts.



This slide shows the basic concept of the new system of which the Author started to think. The bottom left figure shows the existing DD machine for single side printing, while the bottom right figure is the layout image of the new system. Most of the current components are required to stay there in the setting of the minimum problem. The drum should have the print master of the both sides. All the functions of turning the paper to the back side and re-feeding it should be done in the space at the bottom-left corner of the machine.



Obtaining the basic concept with the help of TRIZ has prepared for the next big idea, the Author writes. The knowledge obtained during the investigation they made before also made this possible. The scheme shown at the bottom describes that a paper printed on the A side should be fed to the drum in the next cycle to print on the B side. The drawing shown at the right half was created at the time when the Author obtained this idea. At this timing the Author became confident in realizing a new Auto Duplex Press, he writes.



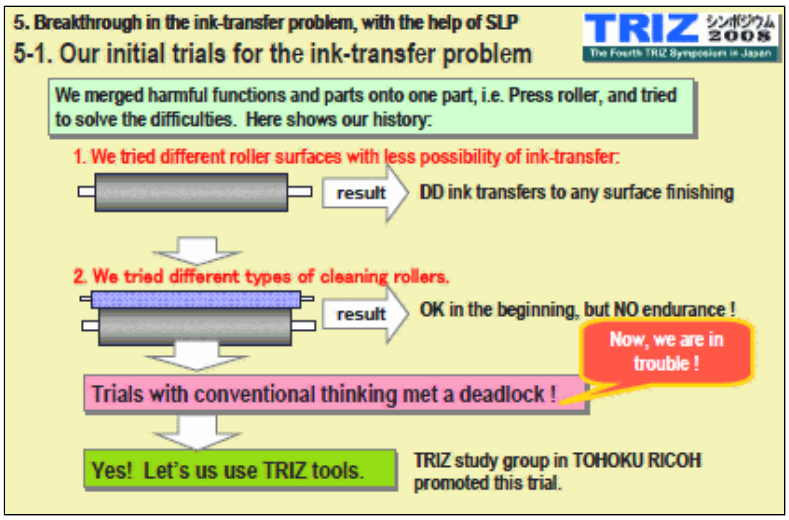
Then the Author writes:

- We made the proposal of development in a week.
- We officially started the development of basic elements for auto-dual press! To implement the basic scheme.

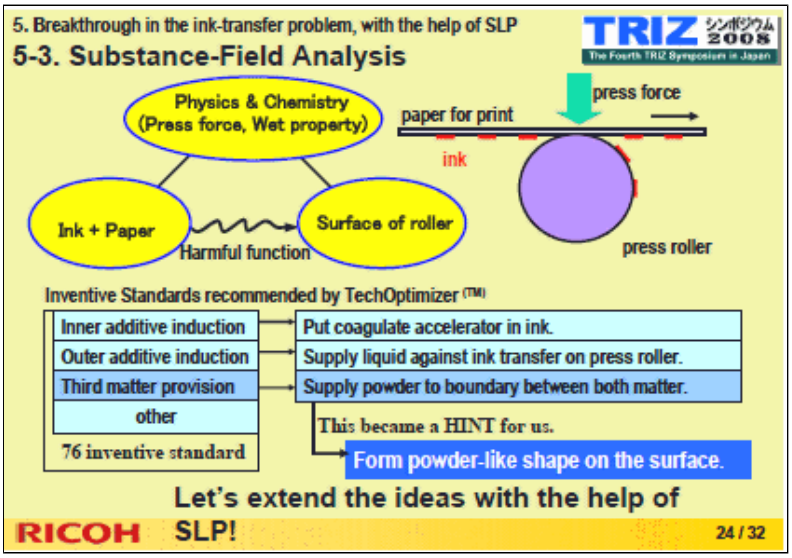
The story how the Author (and the TRIZ Study Group in RICOH) solved the 'ink-transfer problem' is very interesting. Thus let's follow his several slides:

The basic concept described in the preceding slide assumes that the print master of two

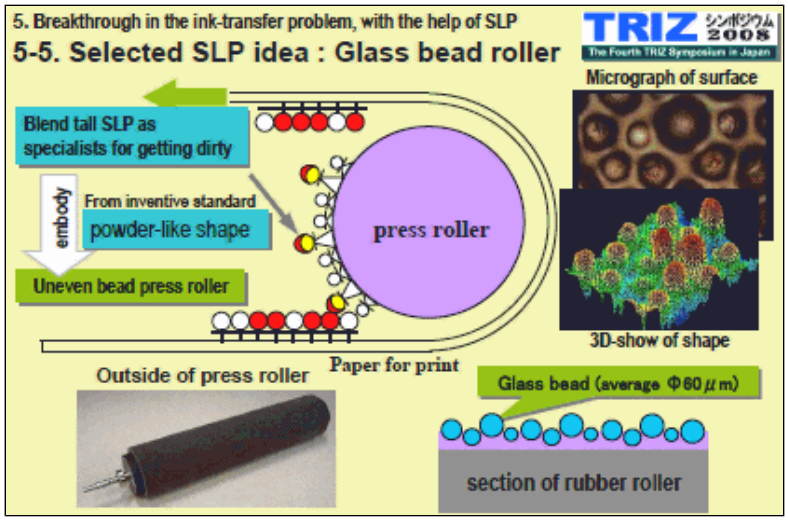
sides is attached on one Drum and hence the Press Roller must be used to print the two sides at different times. So the problem of ink-transfer must be solved in the system around this Roller. The initial trials were made as shown in this slide. First they tried to investigate a surface which does not get dirty, but it failed. Their second approach was to use a subsidiary roller for cleaning the main Press Roller; but it also failed. On facing the deadlock, the Author brought this problem to the TRIZ Study Group in RICOH.



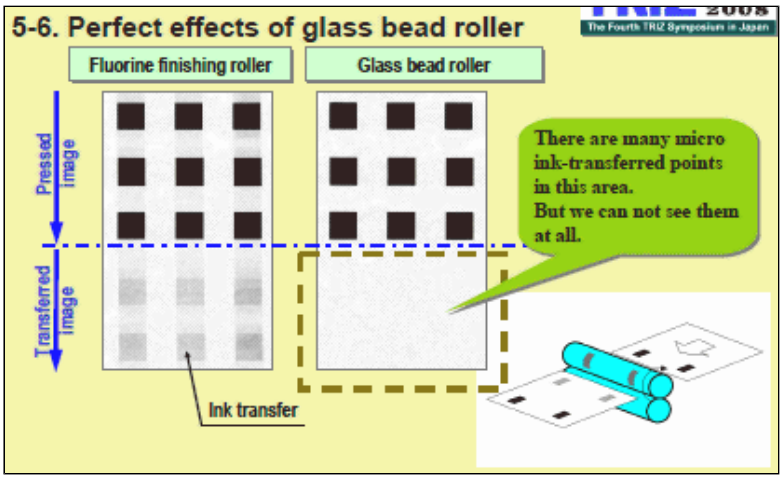
Now the ink-transfer problem was tackled with TRIZ in the TRIZ Study Group. The problem was first formulated in the Su-Field Model. When the paper is printed on the B side, the ink already printed on the A side transfers to the surface of the Roller. This is the Harmful function. Among the Inventive Solutions, 'Provide a third object in between' has suggested to provide some powder in between. Then it has suggested 'powder-like shape of the surface'.



Then they used the SLP method for considering this problem further. They imagined SLP on the surface of the Roller and that the SLP do not want to get dirty with ink. They have generated 30 ideas; here shows the idea they have finally chosen. Among many SLP there are some taller ones who get dirty to protect others; i.e., instead of all SLP getting dirty, small percentage of SLP becomes dirty. This idea of SLP was realized in the form of glass beads attached on the surface of the rubber roller, as shown in the figures in the right column.



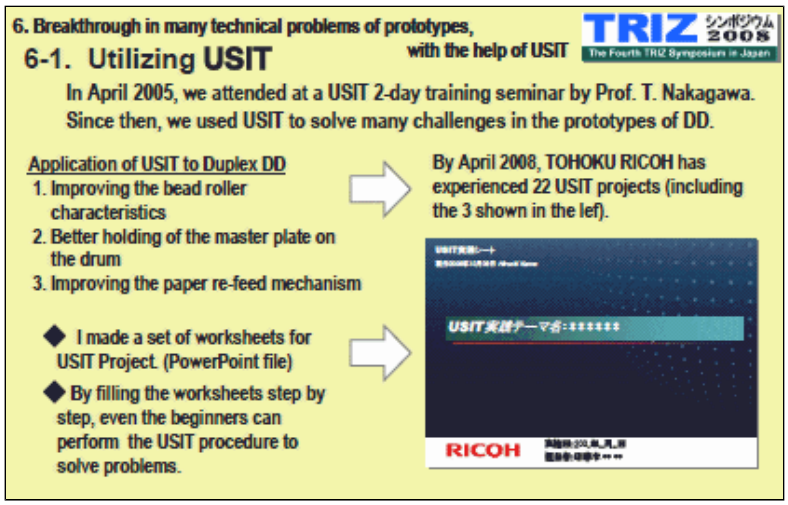
This slide shows the effects of the glass bead roller. In this experiment, black patterns are printed in the half of the page. After printing both sides, the white half of the page is checked to see any traces of transferred ink. We can see the transferred ink patterns in the left case, but no patterns in the right case with the Glass bead roller. In the latter case, actually there are many micro-scale ink-transferred points, but we cannot see them.



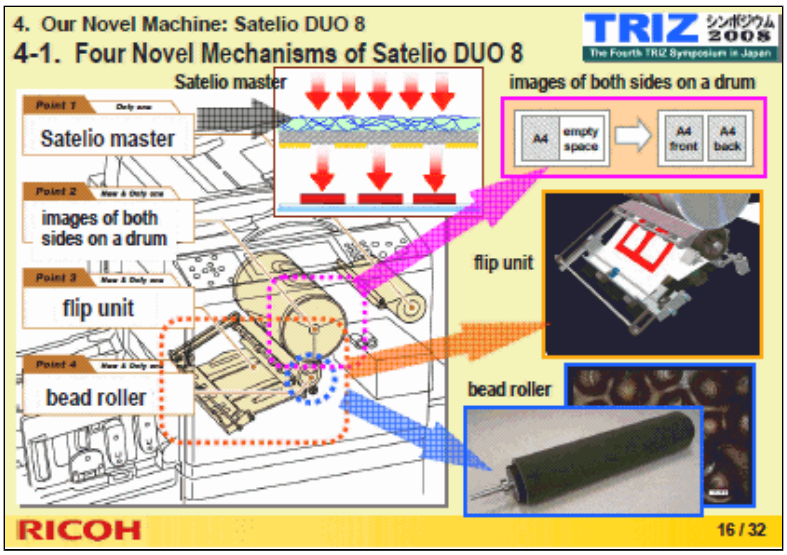
In concluding the issue of ink-transfer, the TRIZ SLP thinking is discussed here. Thinking with the help of TRIZ, especially with SLP, is to think problems in an abstract world. Breaking stereo-type thinking, or psychological inertia, is the power of this abstract thinking, especially right-brain type thinking, in TRIZ. As shown at the bottom of this slide, the solution thus obtained may be regarded as the roller surface having an uneven micro structure (while the surface is even in macro structure).

Later in April 2005, the Author (and his senior colleague) attended at Nakagawa's USIT 2-day training seminar. Since then they used USIT to solve many problems in designing their prototype machines, the Author writes.

The Author made a set of USIT worksheets (they were shown in the slides quickly as an animation, but not cited here). For these three years they have experiences of 22 USIT projects with success in Tohoku RICOH. (Some other people in RICOH's TRIZ Study Group also have mastered USIT beforehand.)



After these development efforts, the Author's group have succeeded in sending a novel machine to the market in March 2007. The new machine, named Satelio DUO 8, is possible to print both sides with the speed of 240 A4 pages/minute. This slide summarizes 4 novel inner mechanisms: (1) a new print master of composite layer structure, (2) images of both sides on a drum, (3) flip unit for paper re-feed, and (4) the bead roller.



The mechanism of the Flip Unit is shown in this slide (sorry but I cannot include the animation and movie of the presentation). A new paper comes in along the green dotted arrow to the printing zone between the Drum and the Roller. The (A-side) printed paper goes down, with the help of the switcher in the red position and the air blow (blue arrows), along the green arrow. The paper is held (by the red tray edge) and guided smoothly in a way like Baton Relay to the bottom and is flip back along the pink arrow. The paper is moved along the pink arrow around the Roller to the printing zone and is printed on the B-side. Then the paper is sent out along the pink dotted arrow. The sharp switching back of the paper is named 'Swallow Turn'.

This slide concludes the presentation. The Authors have developed a machine for auto duplex press, which was a dream for 20 years. TRIZ helped the Author to generate the novel basic concept of the machine, and USIT also worked later. They have applied over-100 patents (Mar. 2007) and built strong patent barriers. The machine, Satelio DUO 8 was released in March 2007. The machine doubled the speed of A4 size printing from 120 pages/min (single sided) to 240 pages/min (double sided) in a compact body as before. This machine obtained high reputation from the customers.

*** This work is a very successful case study which developed a novel product, of the type first in the world. TRIZ (and later USIT) contributed to develop novel basic concepts and to solve problems in the prototype development. The new product has been accepted well by the market and will certainly contribute to the business of the company. The description of the presentation is detailed and full of information; especially the Author's thinking process in TRIZ can be traced well. This is an excellent presentation in the present TRIZ Symposium. The full set of presentation slides will be posted in the Web site in the near future.

USIT Training Seminar Group (IDEA Co.): Tetsuya Sudo (Sekisui House Co.), Hiroshi Sakata (Hitachi Research Laboratory, Hitachi Ltd.), Keiichi Hasegawa (Bridgestone Co.), Katsura Hino, Akira Kato (Kokuyo Furniture Co.) and Toru Nakagawa (Osaka Gakuin Univ.) [P-B4 #29] gave a Poster presentation with the title of "**USIT Case**

Study: A Mom's Bicycle Able to Carry Two Children Safely". This multi-company group was formed in March 2008 as one of three practice groups during the USIT 2-Day Training Seminar held openly by IDEA Co. and instructed by Toru Nakagawa. The topic of problem solving was suggested by Nakagawa in this case. After the 2-day training, T. Sudo wrote the case study report by filling in a template and attaching the digital image records. The report was revised a few times by the members including Nakagawa and Sakata via email communications. During the Symposium, the Poster presentation was made by T. Sudo in Japanese and by H. Sakata in English at two adjacent places.

The back ground of the problem is written here. Since this is a familiar problem all the group members shared the problem easily. [TN Oct. 28, 2008: The correct figure is set .]

■Background of theme selection (Suggested by T. Nakagawa)
- Carrying two children on a bicycle is currently Prohibited by the Road Traffic Law.
- However, under strong requests from mothers, the National Police Agency has recently shown the intention to permit it if safe bicycles are made available.
- This is a hot theme in Japanese society today and worthy of thinking about.

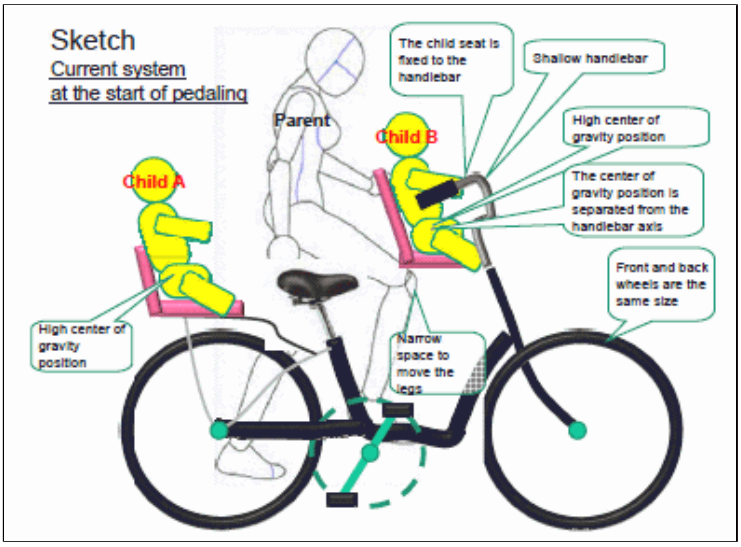
The group first discussed about the scope of this problem and set the basic strategy as shown in the slide.

⇒ Basic strategy selected
① Focus on a bicycle, but include the use of stabilizer wheel attachments and three-wheeled cycles.
② Do not impair the convenience of a standard bicycle.

Then the problem definition was carried out through discussion. The proposed problem, i.e., A Mom's Bicycle Able to Carry Two Children Safely, was already a clear statement of solution target. Thus the statement shown in the slide is a breakdown of the target.

★Problem definition statement :
The design should enable steady riding at low speed, easy supporting with legs when stopping and leaning to one side, and preventing from falling over.
★Sketch :
Next slide
★Root cause : **When a bicycle stops, it falls over without a support.**

Then the Group drew a sketch of typical current system. A child seat is set at the back and another at the handlebar. Various points of difficulties, especially at the timing of starting to pedal, are drawn in this figure.



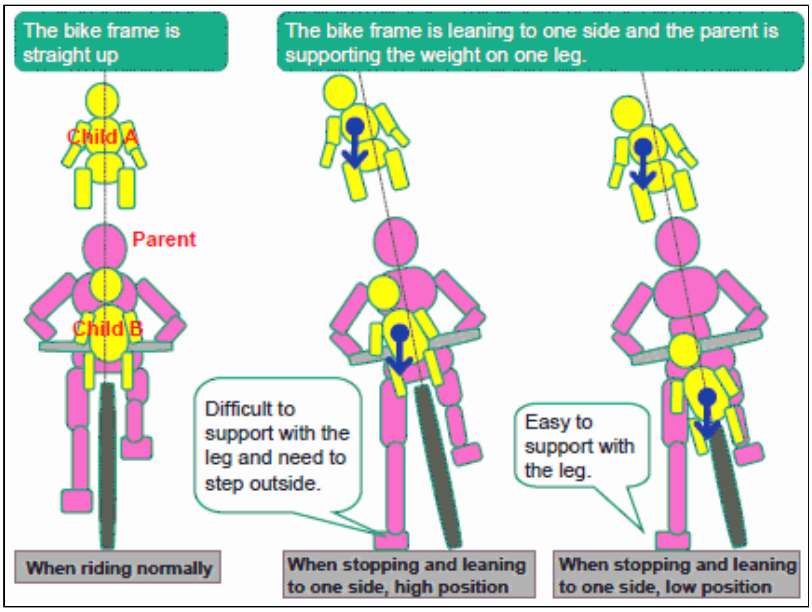
Then USIT guided to the Problem Analysis stage. In the beginning of the problem analysis, the Instructor advised to perform the Time-characteristics analysis first.

The timing dangerous for the bicycles are shown in this slide. When the bicycle is driven at a certain speed, the bicycle is safe. This has clearly shown the situations which the Group has to address.

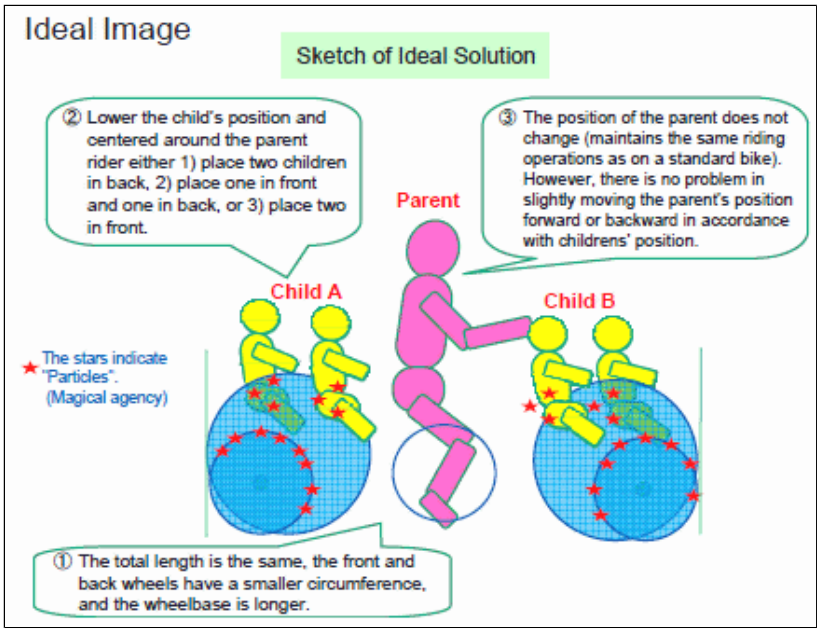
⇒ There are 5 dangerous situations, namely, when mounting, starting off, suddenly braking, stopping, and getting off.

Then the Group tried to use the Functional Analysis and Attribute Analysis. During these analyses, one of the issue which needed a clearer understanding was the effect of the height of the children's seats. Discussions using the side views of the bicycles did not give a convincing logic. The front (or back) view of the bicycle together with the child and the parent was drawn after the seminar, as shown in this slide. This figure captures the critical timing when the bicycle frame is leaning to one side and the parent is supporting the weight on one leg. If the child is seated at a high position, the child's weight can cause load even

outside of the supporting leg. Whereas if the child is seated at a low position, the child's weight can be supported easily. This is a nice example of importance of 'viewing from other (appropriate) angles'.



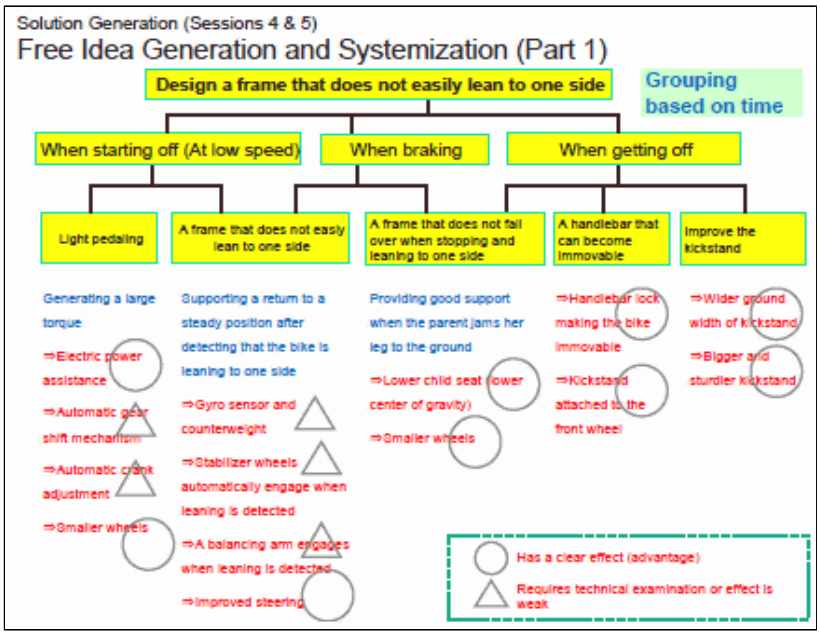
Then the Group went ahead to figure out the Ideal Image of the system. Drawing an ideal image was rather difficult in this case. Members tried to draw various images. But all of them were drawn with the bicycle frame, wheels, handle, children seats, etc. Thus, they were trials of 'better' concrete designs, and they can never be 'ideal'. There was one 'unfinished' drawing where only the parent, a child in the front, another child at the back, and wheels. No bicycle frame was drawn yet. The figure shown in this slide is an extension of the 'unfinished' drawing. It can be an 'Ideal Image'. This tells that the children should be placed at lower position, either in the front or at the back of the parent, and that the wheels should be smaller than the original and the total length of the bicycle may be the same. You can imagine all other details, such as a frame, a handle, pedals, etc. This figure was actually drawn after the seminar, and it covers almost all the solutions proposed in the present paper.



The Particles Method of USIT advises to break down the desire expressed in the image of the 'Ideal system' and to think of various ways for achieving such goals. A tree-structured diagram was drawn in the Particles Method (even though not shown here), and it became the basis of generating ideas in the next step.

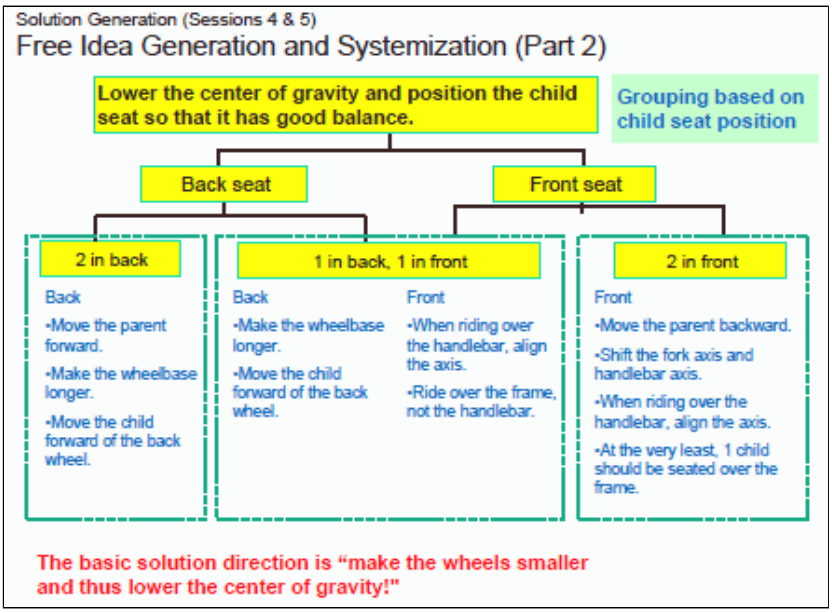
Then the Group wrote down all the ideas which had come up in their mind during the analysis stage. The ideas written in the Post-it Notes were classified and reorganized into three parts of hierarchical diagram of solutions, as shown here in the subsiquent three slides.

The first slide summarizes the ideas for making the bicycle frame not apt to lean to one side at the timings of difficulty. The ideas were roughly evaluated according to

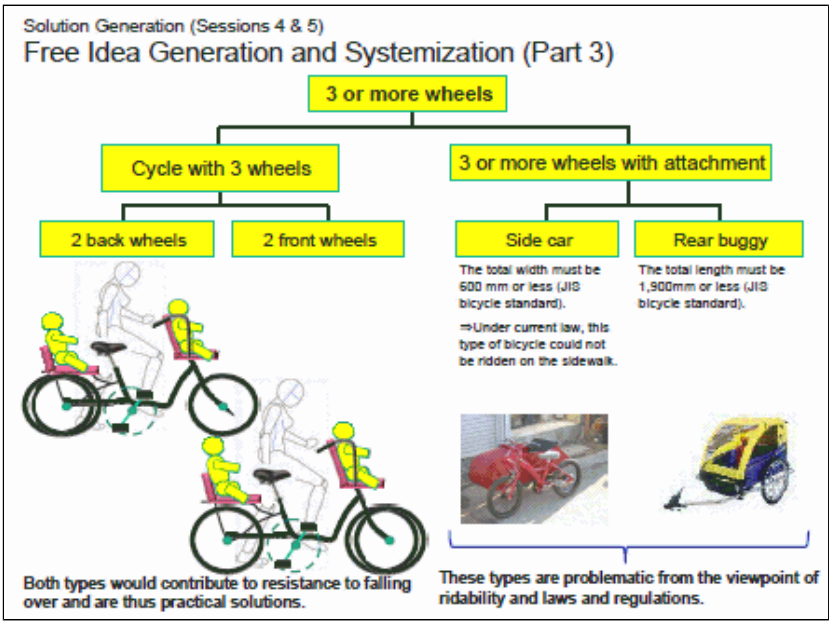


their possible effectiveness.

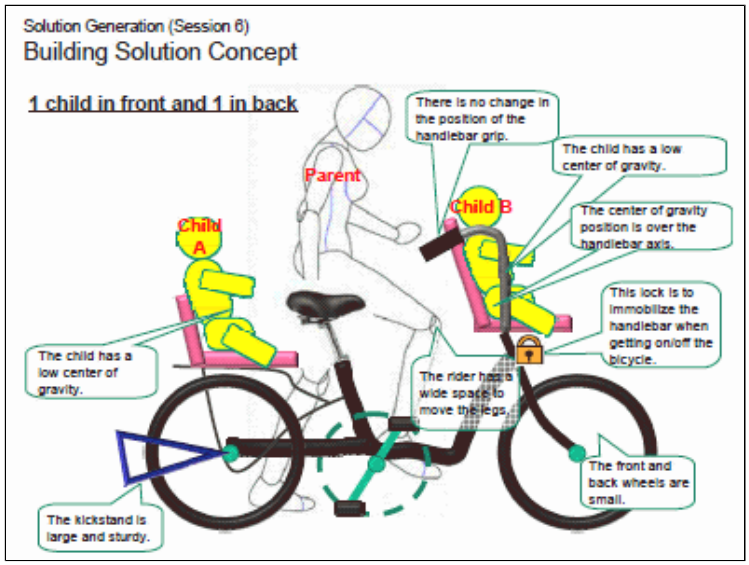
The second tree diagram shows the ideas related to the positions of the two child's seats. The basic direction is 'to lower the child's seats'. The wheels are the main obstacles against this direction. We should better reduce the size of the wheels (even though the comfort of riding is somewhat reduced), and we need to think various alternatives of the seat positions, i.e., either front or back of the parent and also either front, back, top, or between-the-split wheel. The solutions of one child in back and another in front (of the parent) are most typical, whereas solutions of 2 children in back and solutions of 2 children in front are also possible.



The ideas of solution having 3 (or more) wheels were known and were generated. The motivation of these ideas is (a) to stabilize with 3 wheels against falling over, (b) to make additional place for putting the seat, and (c) to split the wheel to place the seat in between. These solutions are likely to reduce the easiness of operating the bicycle, e.g. turning and stepping up, and hence they need special additional design solutions.

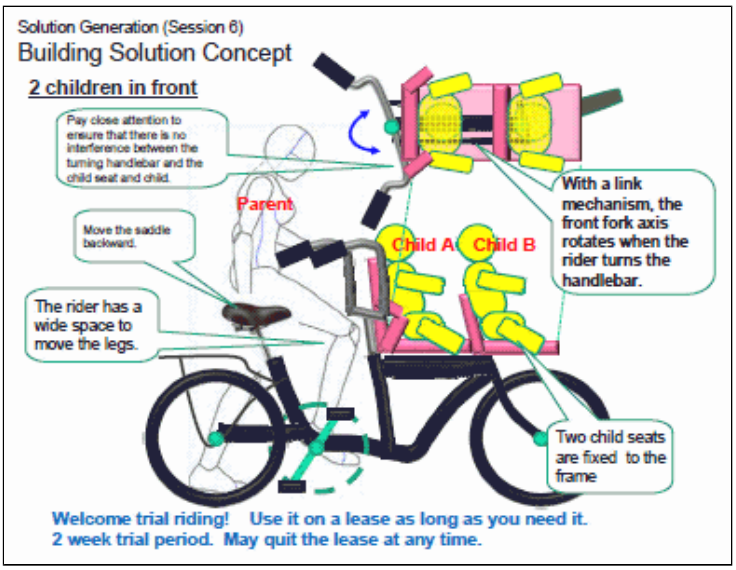


This slide shows a solution concept built during the Seminar. A number of small ideas of improvement, more or less known beforehand in some form, were assembled here. Probably this will be a typical solution available soon along the line of traditional popular design.



This slide shows a novel solution concept built after the Seminar. The intention of this solution is to place a child seat fixed to the

frame (but not the fork axis) in front of the parent. Such an arrangement, however, causes the difficulty of narrow space for the parent's leg movement. We thought that this difficulty comes from our assumption of the handle axis being the same as the fork axis of the front wheel. By separating these two axes in the space, and linking them with some mechanism, we can create a space for placing the child seat fixed to the frame. This idea was demonstrated here with the exaggeration of placing 2 children in the front of the parent. This new arrangement is nice for the children to have clear front view and for the parent to be able to take care of them all the time. Since this new bicycle may need some riding practice, a system of lease is introduced.



The evaluation of the USIT 2-day Training and of this case study is written here by the Group members (not including the Instructor).

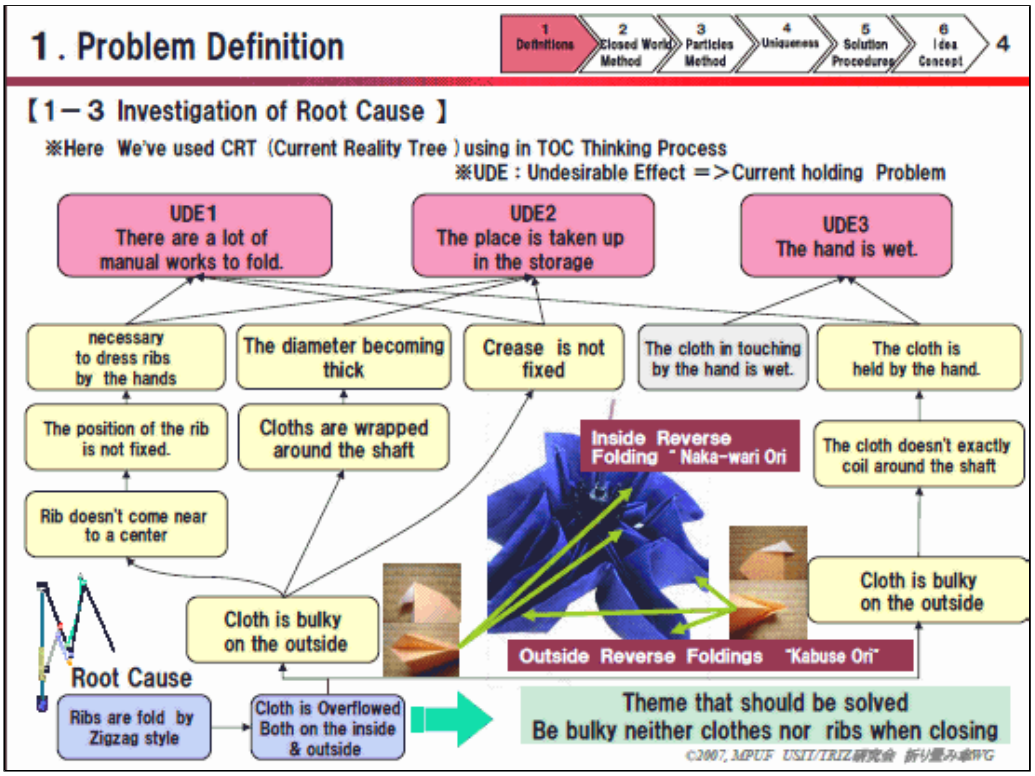
Evaluation: Non-specialist participants from diverse backgrounds worked on this topic in cooperation and generated useful solutions within a limited time. Thus the training exercise and the afterward case-study writing were meaningful and satisfying experiences.

MPUF (Microsoft Project Users Forum) USIT／TRIZ Study Group: Kouichi Nakamura (SONY Corporation), Etsuo Yamada (MPUF USIT/TRIZ WG), Minoru Takimoto (Fuji Xerox Corporation), Hirofumi Hasaba (MPUF Secretariat), Noritaka Nakayama (Konica Minolta Technology Center, Inc.), Hirotake Makino (Yokogawa Electric Corporation), and Yuji Mihara (Creative Technology Institute Co., Ltd.) [P-A6 #46] gave another interesting Poster presentation with the title of "**USIT Approach for Compact Umbrella**".

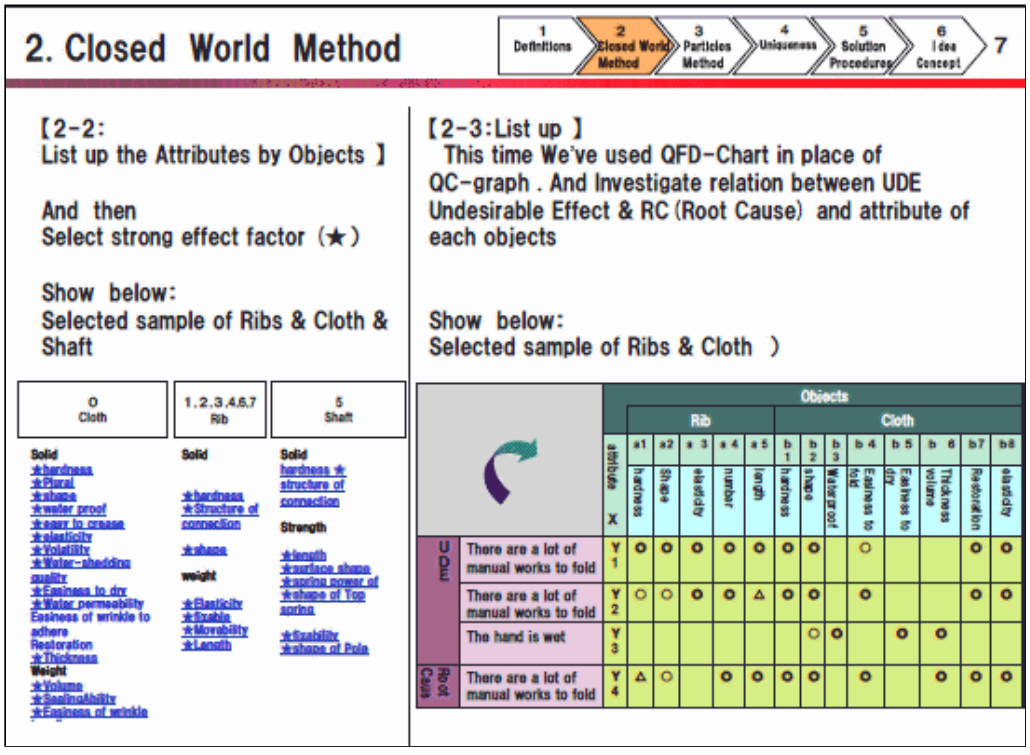
MPUF is a network-based loose organization of voluntary people of common interest on Project management and various related methods. MPUF was originally organized by Hirofumi Hasaba and Keiko Ichinoki as the users group of the software Microsoft Project. It has a well organized active Web site Jap. partly public and partly limited to the members of free registration. MPUF currently has over 10,000 registered members and operates nearly 20 voluntary study groups on the topics of Project management, QFD, TOC, Taguchi Method, etc. USIT/TRIZ Study Group was started in April 2007 by Toru Nakagawa and Yuji Mihara on the request from the MPUF office. The purpose is to learn TRIZ and (particularly) USIT, together in a voluntary group. It has about 150 registered network members; about 20 of them coming from different industries are active to attend nearly-monthly off-line meetings held in Tokyo on Friday evenings. The Study Group had 3 Working Groups which tried to make group practices of USIT on different themes. The 'Compact Umbrella' WG is particularly active and had their own off-line meetings about 20 times.

This presentation has rich contents, in its methods and in its solutions. The top author, Kouichi Nakamura, is a Six Sigma Blackbelt working actively in SONY and tried to master USIT from various angles. Thus the method applied here is composed of USIT in original Sickafus' way, USIT in Mihara's way (i.e., a modification of Nakagawa's way), and TOC, QFD, etc. as introduced by Nakamura and WG members.

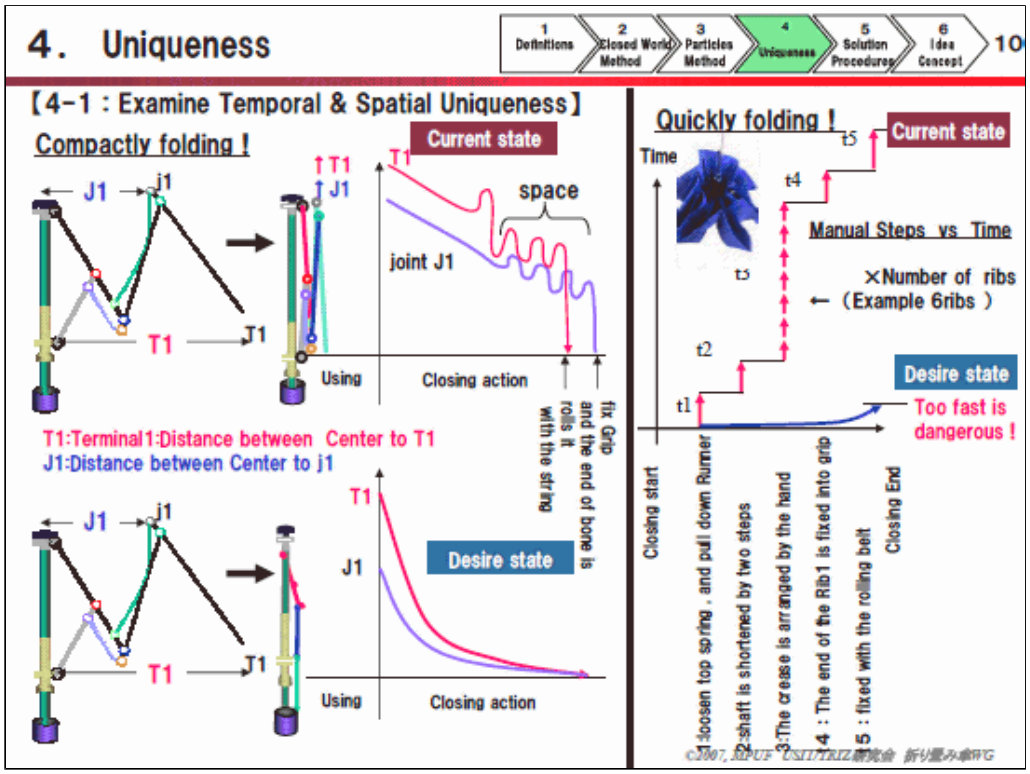
The following slide shows the definition of the problem. When we fold a compact umbrella after using it, we need to handle the ribs and cloths with a lot of manual works and get wet in the hand. We would like to have some new method for folding the umbrella easily or some new product in place to the ordinary compact umbrella. As a part of USIT process of problem definition, the root causes are discussed and presented here in the form of TOC's Current Reality Tree.



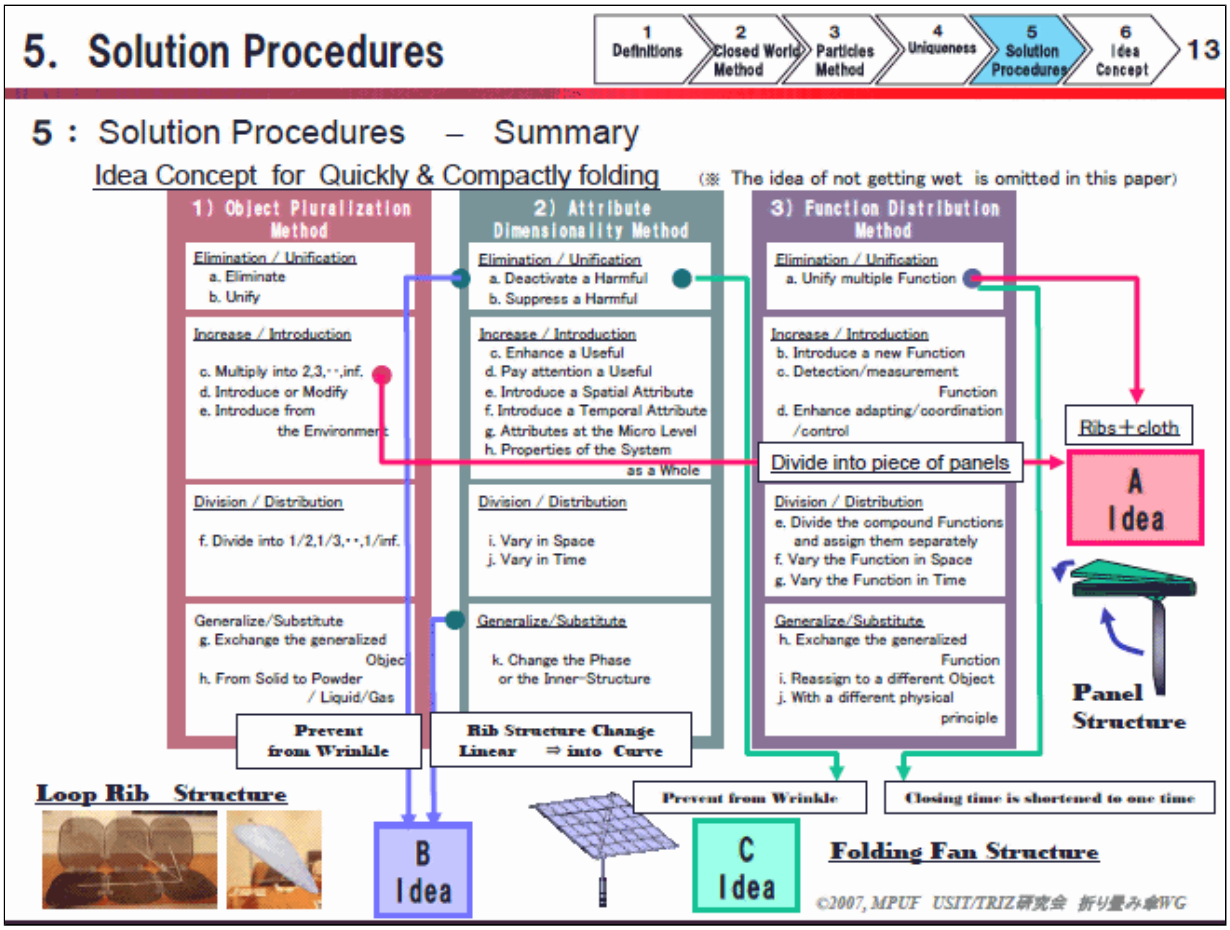
In the analysis stage, after the Functional Analysis, the Attribute Analysis is shown here. USIT suggests to list up the object's attributes relevant to the current undesired effects, and to distinguish them either increasing or decreasing relationship. In the slide, such attributes are examined more closely in the form of (simplified) QFD chart.



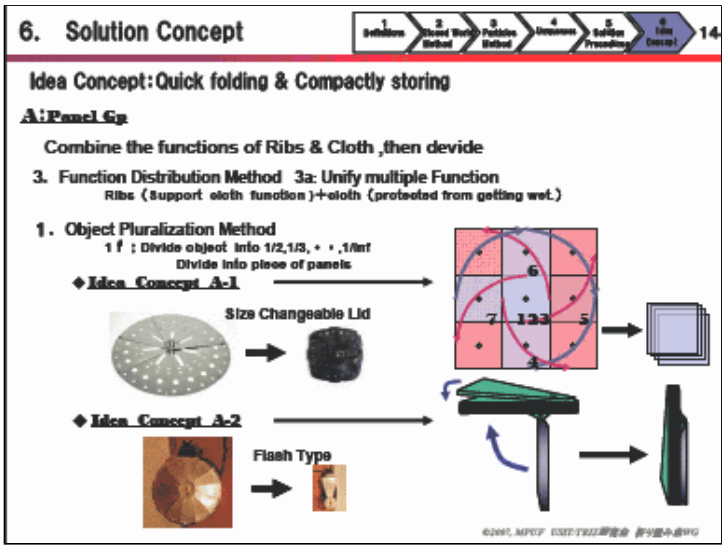
'Uniqueness' is the term by Sickafus for the space and time characteristics analysis. The folding process is examined here with illustrations and graphs.

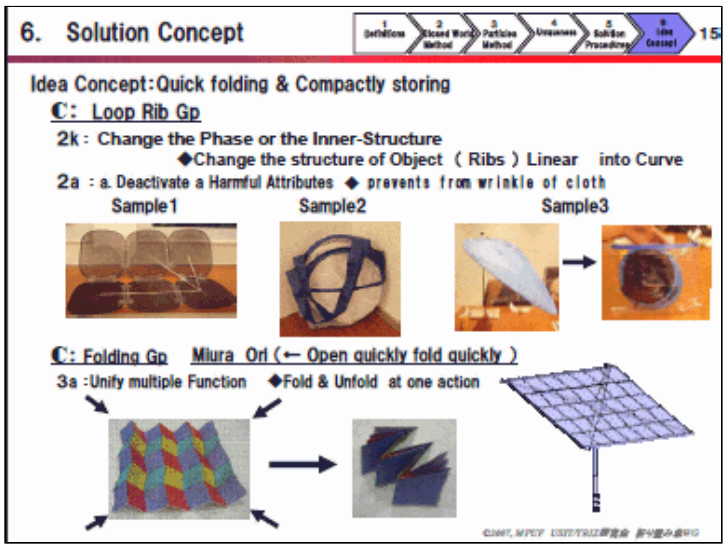


Then the WG worked out a large number of ideas. The slide below gives a summary of solution procedures. The three main USIT Operators are shown here, after grouping their sub-operators (as suggested by Tateki Oka). Several principal ideas, which will be shown below, are linked to the USIT Operators which (can) generate the ideas.

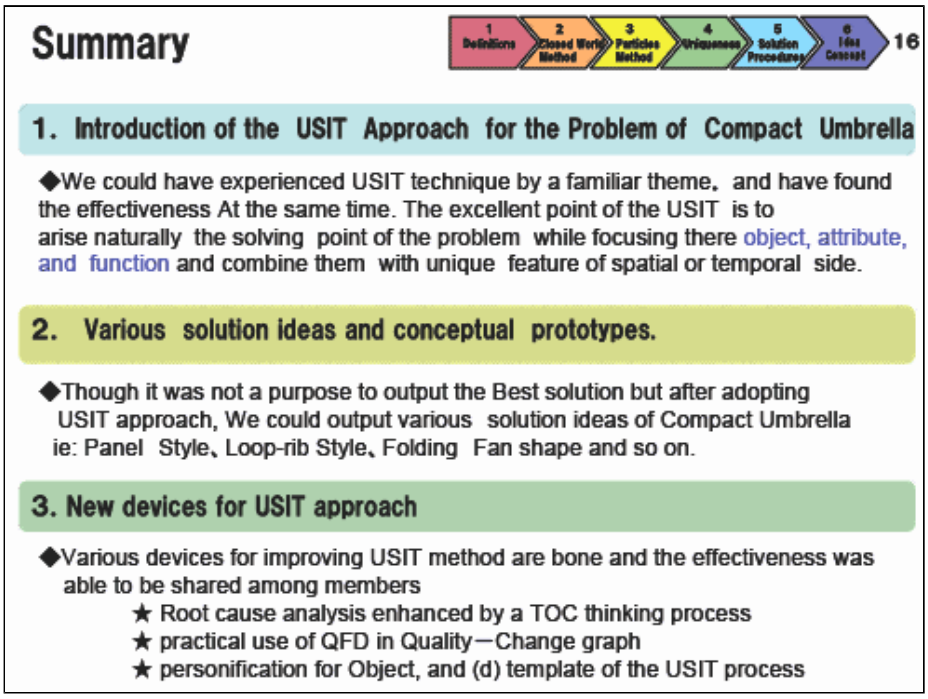


The Solution concepts finally obtained are shown in the following two slides. The WG is active to get ideas by using hints from various products. And the WG actually made prototypes of their ideas and demonstrated them in the Symposium Poster presentation; they were amusing and amazing.





The following slide shows the conclusion of the presentation.

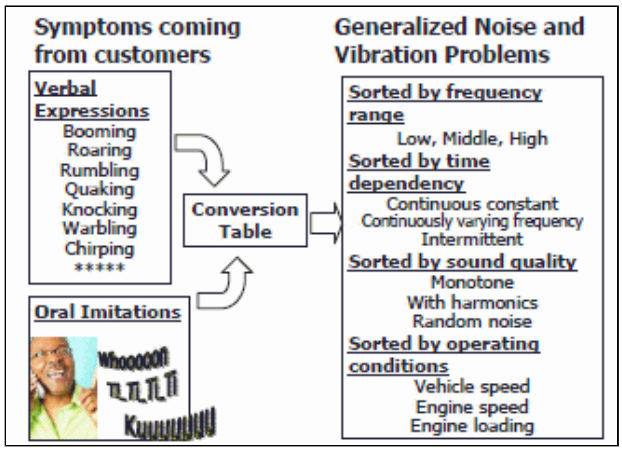


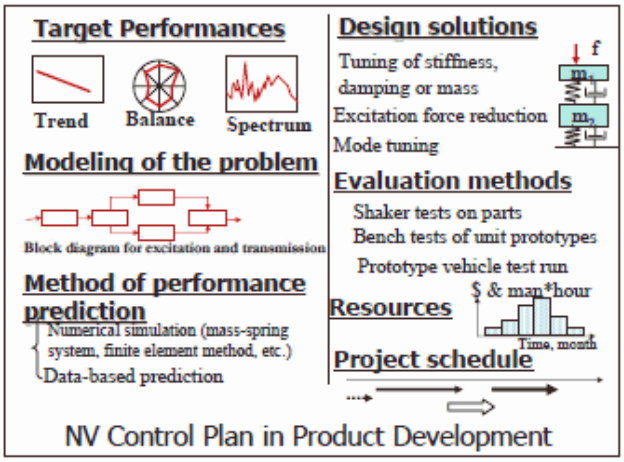
*** This is an intensive and nice case study of USIT. It has generated a lot of interesting solutions, and also various ways of introducing useful adjacent methods into USIT. When we want to learn a methodology seriously, we usually try to make the method more clearly structured (e.g., using templates and checklists, etc.) and more closely/elaborately analyzable (e.g., using detailed tables). This case study is not an exception. However, we should always try to make the methods as simple and as effective as possible. (See Ed Sickafus' Comments Engl on Nakagawa's paper.) During this work I suggested to the WG to work more on the cloths and to find some practical ideas for improving the current compact umbrella. I think we need some more trials in this direction. The full set of presentation slides will be posted in this Web site in near future.

Masao Ishihama (Kanagawa Institute of Technology) [O-17 #24] gave an oral presentation with the title of "**Application of TRIZ to Noise and Vibration Problem Solving -- Fusion with Traditional Theoretical and Empirical Approach --**". First I will quote his abstract:

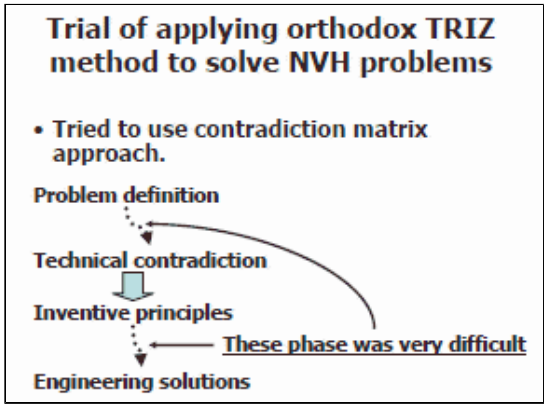
> Conventional textbooks on noise and vibration (NV) control almost always describe analysis methods only and don't provide methods of solving problems. On the other hand, handbooks contain solutions of "specific" problems, but they don't necessary give readers solutions to general problems. In this study, the author tries to connect NV theory with TRIZ idea of solving problems for giving engineers rules of thumb of NV technology. This method converts specific concrete problems into abstract general problems by sorting symptoms by frequency, time dependency, etc. Then these general problems are placed in suitable categories classified by equation of motion in NV theory. Then rules of thumb described with problem solving manner is given.

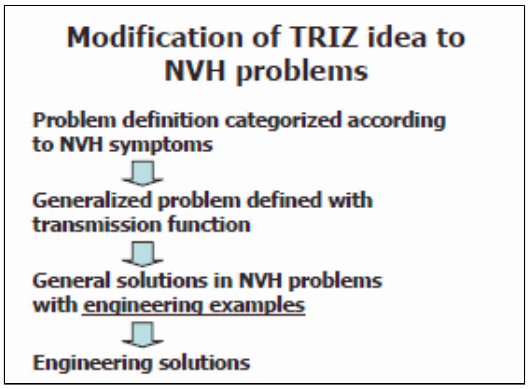
The Author shows his generalizing approach in the following slides, first from the traditional viewpoints:





Then he is trying to apply TRIZ in this field of technology. The below-left slide shows the approach of using the Contradiction Matrix; but he has found the approach insufficient. The Author's new approach in the present study is summarized in the below-right slide; this approach follows the standard Four-Box Scheme of solving problems by use of general, abstract theory.

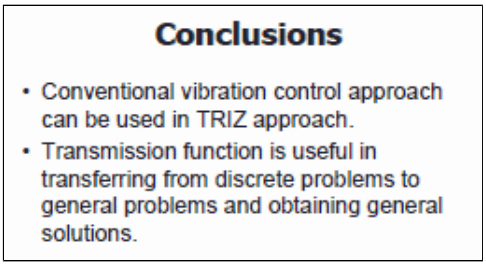




In the present approach the Author categorizes the problems first by using Noise & Vibration (NV) symptoms. Then he represents the problem in a generalized way by using the Transmission Function. [Note (Oct. 20, 2008 TN): Quotation of 2 slides is temporarily suppressed on Author's request.]

By reviewing various known solutions in this field, the Author has classified the general solutions as shown in the following slides. General solutions in each category are demonstrated with a number of examples. Some of such solutions and examples are illustrated in the subsequent slides. [Note (Oct. 20, 2008 TN): Quotation of 5 slides is temporarily suppressed on Author's request.]

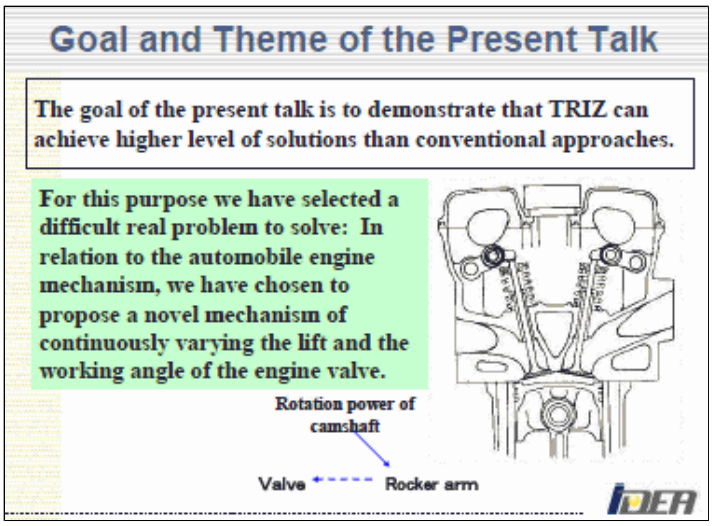
The conclusions by the Author is summarized in the slide shown right.



*** I am not so familiar in this field of technology, but I feel this presentation is a fine example of systematizing a field of technology, where the problems have been handled rather empirically. The general solutions are now expressed in the terms of specific field, but they may be easily linked to the TRIZ terms, such as 40 Inventive Principles and Trends of System Evolution. It is interesting to study whether TRIZ Inventive Principles enhance the system of generalized solutions and stimulate more ideas to the engineers in this field.

Yoshiharu Isaka (IDEA Ltd.) [O-3 #01] gave an Oral presentation with the title of "**TRIZ Improves the Levels of Problem Solving—For Understanding the Effectiveness of TRIZ**".

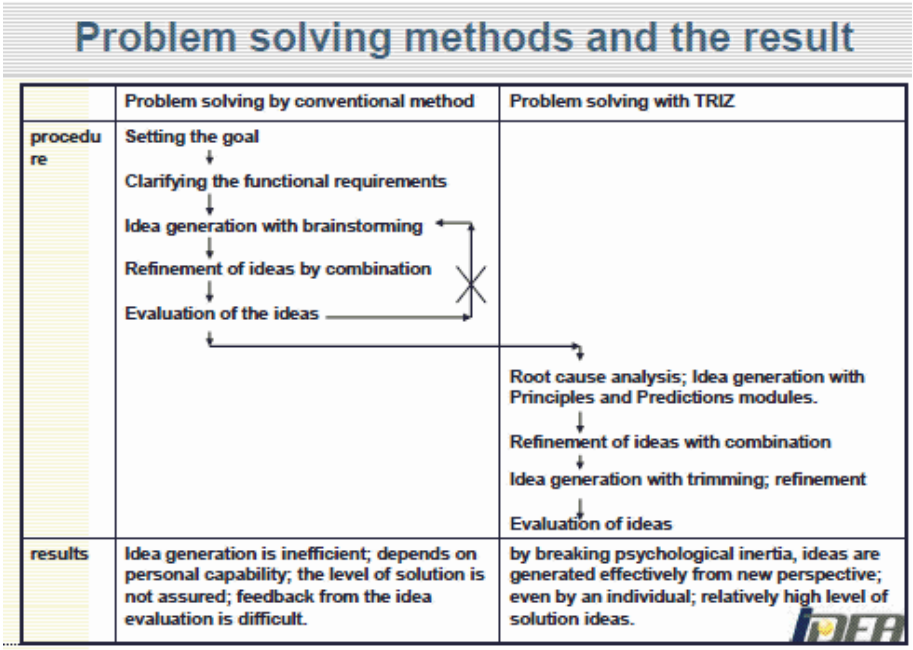
As a TRIZ Consultant, he sets the goal of the present work to demonstrate that TRIZ can achieve higher level of solutions than conventional approaches. So he chose a real problem in the field of his specialty, i.e. automotive engine. Then he himself worked on this problem with the conventional methods for half a year, to obtain a variety of solutions. Then he worked further by using TRIZ.



The process of his work is summarized in the slide shown right.

I do not have enough space here to reproduce his results of a large number of ideas of solutions.

Please see the results of his work in the two stages, shown at the bottom of the slide.



Hiroyuki Suzuki (Hitachi Co., Ltd.) [P-B2 #27] gave a Poster presentation with the title of "**Problems to be solved and Technological Evolution of Magnetic Recording Media**". I will show you the Author's abstract here.

> Magnetic recording medium using metal thin film has been developed by both wet and dry plating deposition. In this paper, dry deposition, especially, physical vapor deposition is focused. Preliminary sputtered disk for longitudinal magnetic recording was developed in the 1970s. In the five patents spanning the evolution of longitudinal recording media from its early stages to the end of its development, the transforming of a single magnetic layer into a multi-layer was proposed to reduce media noise and thermal fluctuation. This was a trend that included at least three inventive principles such as “Segmentation of the recording layer and underlayer,” “Move to a new dimension,” and “Composite materials.”

The evolution of the technology in this field is discussed by using 5 patents developed during 1986 and 2005. The following figure summarizes the layer structures of the 5 media. The Author and his group worked for developing these media. Thus the Author' discussions on the meaning/intention of the specific new technology and on how such technologies were invented are worthy of reading. *** I do not have enough space here to introduce his discussions. Fortunately, the full set of presentation slides and full paper will be posted in English in this Web site in the near future.

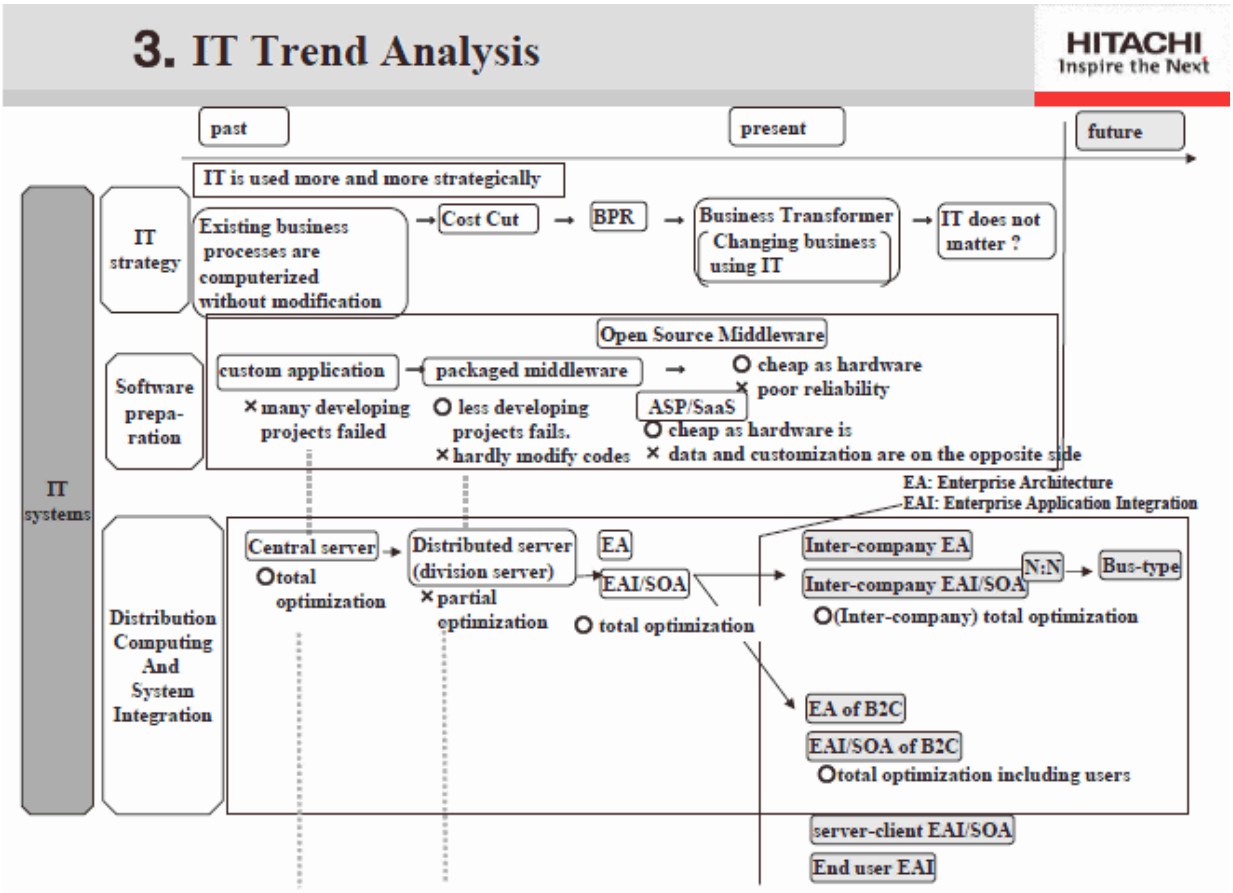
Table 1. Layer structure of the media proposed in the patents (arrows indicate the direction of magnetization)

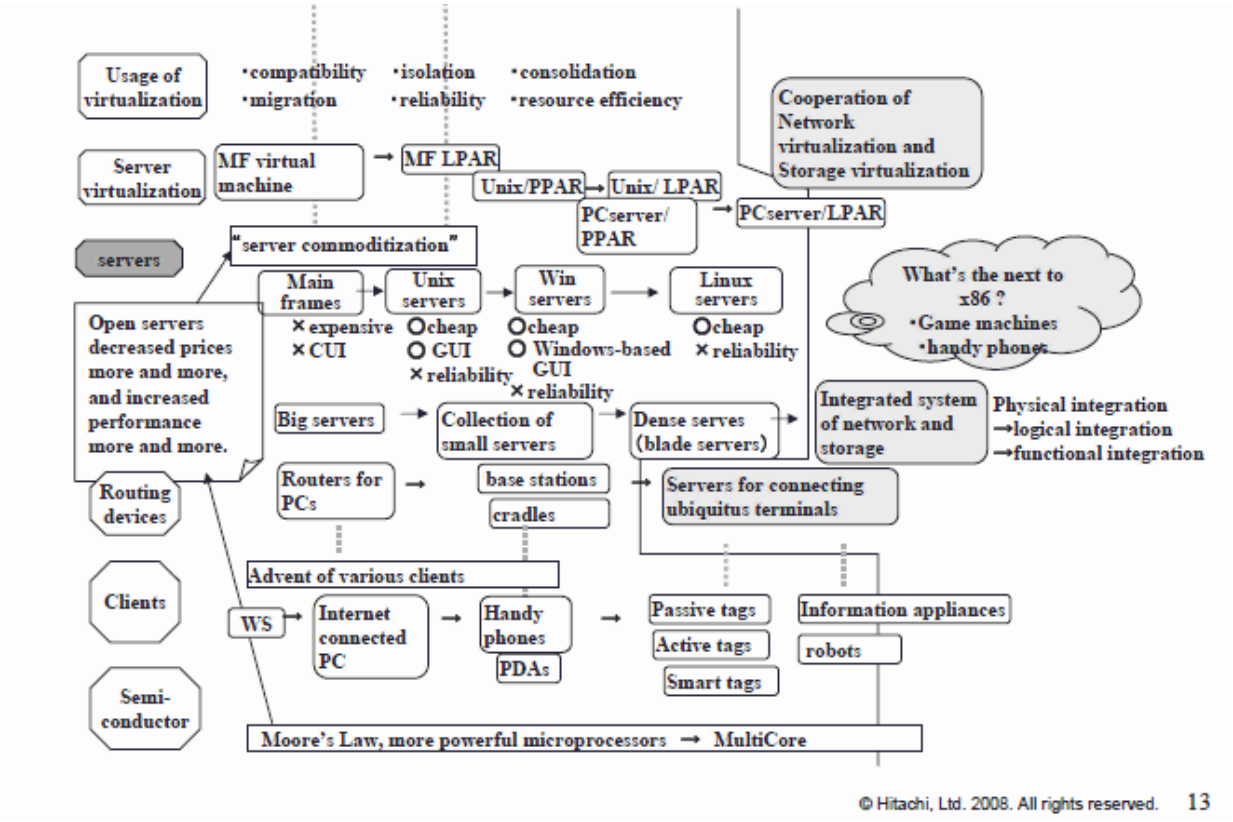
JP 3,033,577	US 5,587,235 JP 3,390,957	US 6,773,834	US 7,273,667 JP Laid Open 2004-355716	US 2006/0292401A1 JP Laid Open 2007-4907
C	C	C	C	C
CoCrX alloy X = Zr, V, Ti, Ru, Ni, Rh, Ta, Pd, W, Pt, Nb, Mo, more than 6 wt.%	→ CoCrPt(15-8)	→ CoCrPtB(14-12-11)	→ Co Alloy	→ CoCrPtB(12-13-10)
	paramagnetic CoCr	Ru	Ru	Ru
	→ CoCrPt(15-8)	→ CoCrPtB(14-12-11)	→ Co Alloy	→ CoCrPtB(12-13-12) → CoCrPtBTa(23-13-5-2)
Cr	Cr–(Ti, Si, W)	Ru	Ru	Ru
		← CoCr11	← CoCrPt(14-6)	← CoCrPt(16-9)
		CrTi10	CrTiB(15-5)	CrTiB(10-3)
Substrate	Substrate	–	Heating, Surface Conditioning	Heating, Surface Conditioning
		RuAl	Ta	WCo30
		CrTi	NiTa35	TiCoNi(40-10)
		Substrate	Substrate	Substrate
Media A	Media B	Media C	Media D	Media E

Toru Shonai and Junji Shigeta (Hitachi Co., Ltd.) [P-A4 #41] gave a Poster presentation on "**IT Trend Analysis by TRIZ Technological forecasting — Using Altshuller's eight patterns of technological evolution—**". The abstract by the Authors is quoted here first:

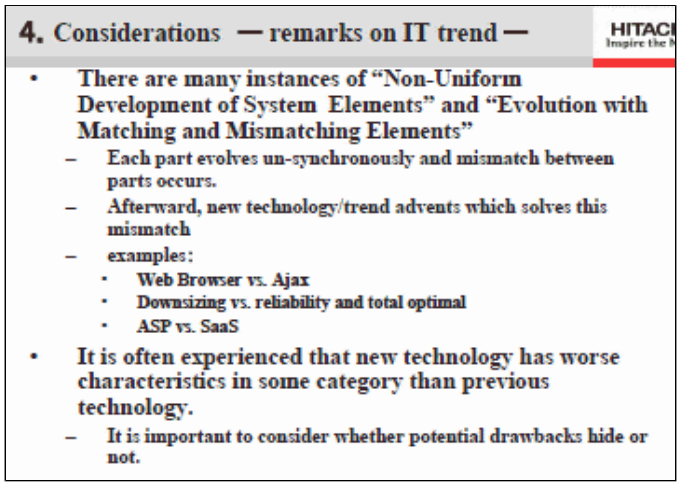
> In order to improve future information technology predicting abilities, we made examples in IT for each of Altshuller's eight technology evolution patterns and we tried to apply them to trends of information systems and servers. We found that these patterns are applicable to IT field and that there are particularly many instances of "system parts completeness law", which says that each part of a system evolves for completeness independently while the system evolves as a total system and that each part of the system evolves asynchronously with alternation of balances and imbalances among parts. The instances include open systems, Linux, ASPs (application service providers) and SaaS (software as a service). Because it often happens in the IT field that some characteristics of a system in the next generation become lower than those in the previous generation by this law, we should make greater considerations for those characteristics.

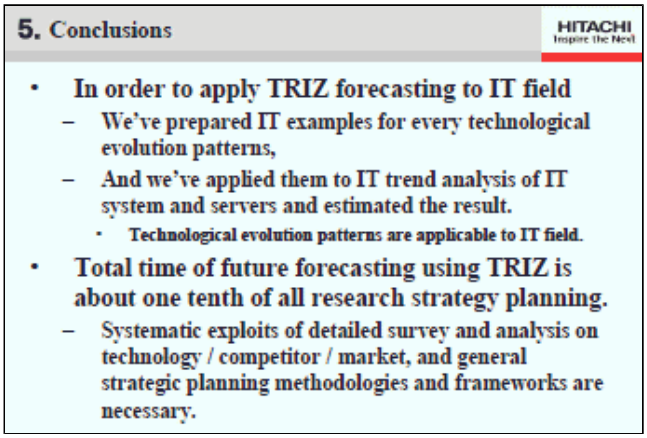
After skipping most slides, we should better watch the last four slides. In the following two slides principal IT technologies are concisely summarized in their categories and along the historical time. Readers more or less familiar in the IT field will find the diagrams interesting.





The remarks and the conclusions by the Authors are shown in the following two slides. *** All the presentation slides will be posted in this Web site in the near future. This work is not written in a full paper yet. I would like to read it whenever it comes out.

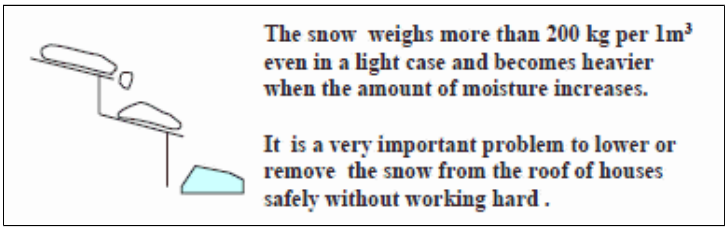




Yuichi Furukawa ( ) [P-C1 #11] gave a Poster presentation with the title of "**Snow vs. TRIZ**".

The Author lives in a snowy, northern region in Japan and had the problem shown in the slide.

He finished the top roof and the middle roof of his house with different paints, so that the snow on the middle roof falls down early and smoothly while the snow on the top roof stays longer and falls down slowly.

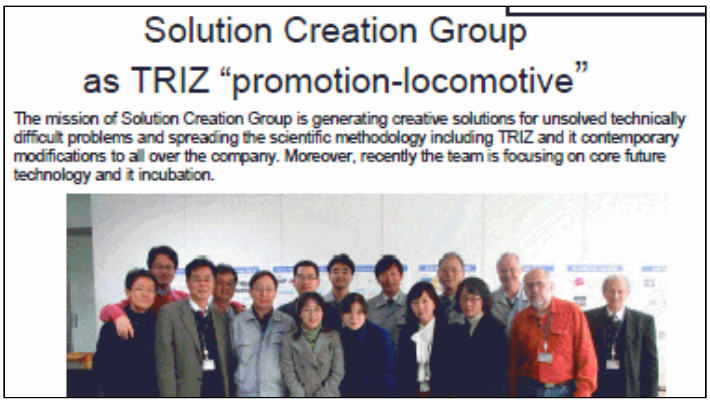


7. Promotion of TRIZ in Industries

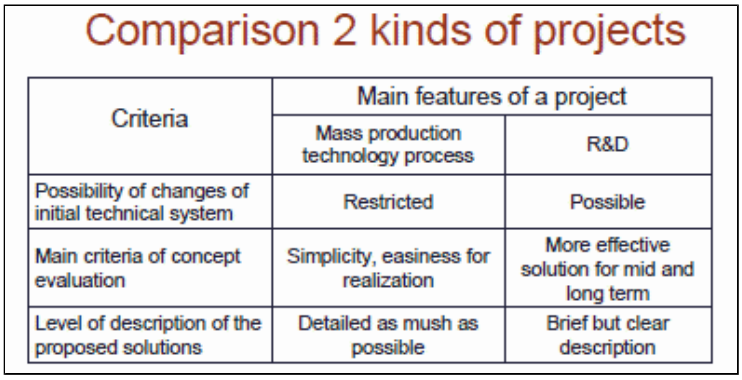
SeHo Cheong, Vasily A. Lenyashin, Alexander T. Kynin, Naum B. Feygenson, YongKwan Lee, Seungheon Han (Samsung Electro-Mechanics Co., Korea) [O-10 #09] gave a presentation with the title of "**TRIZ and Innovation**

Culture at Samsung Electro-Mechanics Company". This is a valuable presentation because Korea, and especially Samsung, is known to be most active and successful, in the world, in introducing TRIZ into industrial problem solving.

The below-left slide shows the 'Solution Creation Group' headed by the Author, SeHo Cheong (Center, back row), and including 3 Russian TRIZ experts (Right). This Group is working in the areas, shown in the below-right slide, using the methodologies of six sigma, CAE, etc. in addition to TRIZ.

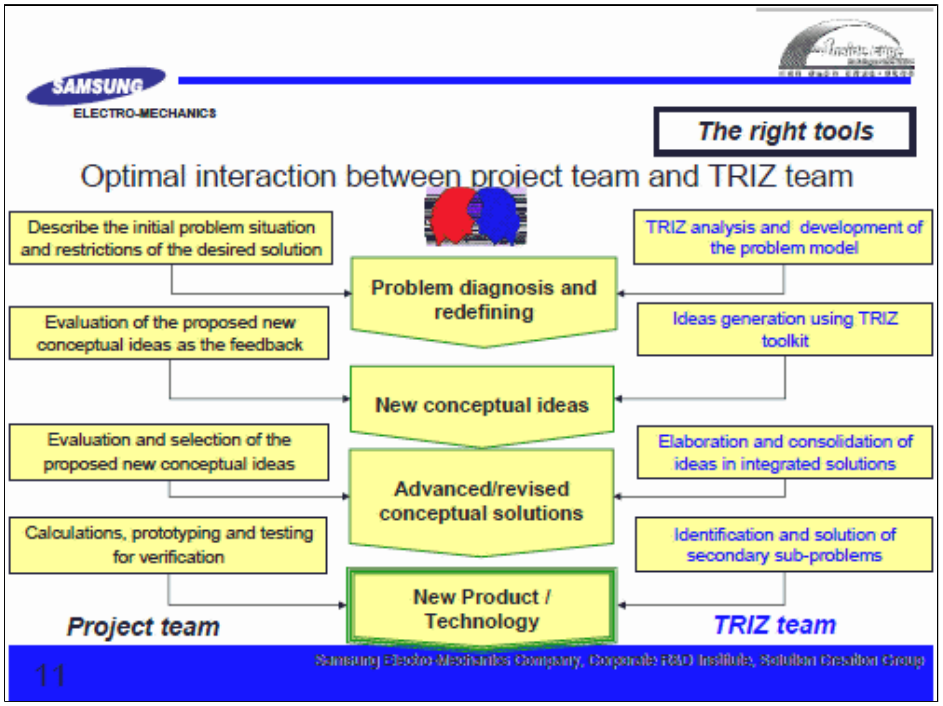


The following slides show typical problems for TRIZ application and two types of projects where TRIZ need to be applied with somewhat different criteria.



Criteria	Main features of a project	
	Mass production technology process	R&D
Possibility of changes of initial technical system	Restricted	Possible
Main criteria of concept evaluation	Simplicity, easiness for realization	More effective solution for mid and long term
Level of description of the proposed solutions	Detailed as mush as possible	Brief but clear description

The style of collaboration between the TRIZ team and the project team of engineers is shown in the following slide. Such collaboration has succeeded in producing much results as shown in the subsequent slide.



Typical results of TRIZ projects

- Improvement of manufacturing efficiencies
  - Resolving key contradictions rather than compromising
  - Using existing but not obvious resources to solve contradictions
  - Reducing the number of parts and complexity of a engineering system
- Recognition patterns of technical evolution and predict how a system will evolve practically
- Implementation practical, simple and low-risk solutions

Implementing TRIZ methodology with continuously modified toolset allows the organization to build a high performance innovative culture and resolve many complicated projects

The education and training of TRIZ to engineers are widely carried out in the company as shown in the following two slides.

TRIZ education

Basic training-programs Main fundamental TRIZ tools such as:

- 40 Principles
- System of standards
- Technical system evolution
- ARIZ etc.

TRIZ education is provided under the guidance of experienced mentors. Main part of education performed on the Korean language. Detailed Korean textbooks are prepared and systematically updated for supporting educational process. The text is supplemented by many examples from real projects and case studies.

TRIZ education

Advanced course of the new development methods such as:

- "harmful system"
- functional approach etc.

Main features of TRIZ education:

- Practical solving of real problems
- Collegial discussion in learner's micro-teams
- individual consultation with participation of Russian TRIZ experts
- Personal follow-up consultations
- Evaluation of outcomes of graduation work completed using opinion of project leader

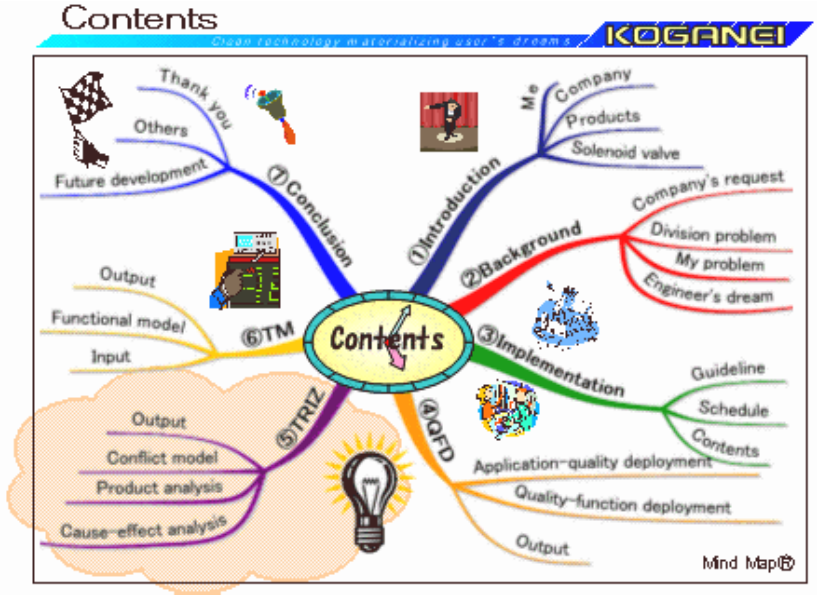
*** Listening to this presentation and talking with the Author, SeHo Cheong, I am rather puzzled about the real situations of TRIZ in SEMCO. As shown in the above slides, TRIZ education is widely done in the company in the Korean language and a number of projects have generated good results by using TRIZ. However, in the Solution Creation Group (of 16 members in the photo), the TRIZ Team is composed by the three Russian TRIZ experts and no Korean engineers. The style of interaction between engineering projects and the TRIZ Team is similar to a contract research rather than a joint work. Mr. Cheong told me that the Russian TRIZ experts have much higher capability in problem solving and hence he cannot imagine to promote TRIZ without them. Is this a good sign or a poor sign after several years of activities of the TRIZ experts? -- Probably, there is a big cultural difference between Korea and Japan; no company in Japan employed Russian TRIZ experts so far. (On Japanese approach, you are now reading a lot of presentations here in this Symposium. Please also refer to Nakagawa's presentation.)

Tomohiko Katagiri, Toshiaki Tsuchizawa, and Takeshi Yamanouchi (Koganei Co., Ltd.) [O-7 #19] gave an oral talk with the title of "**Case Study of Introducing and Applying TRIZ to Real Projects for Obtaining Results (= Benefits): Innovating the Product Development Process by use of QFD, TRIZ, and TM together**".

In the Abstract, the background is explained in the following way:

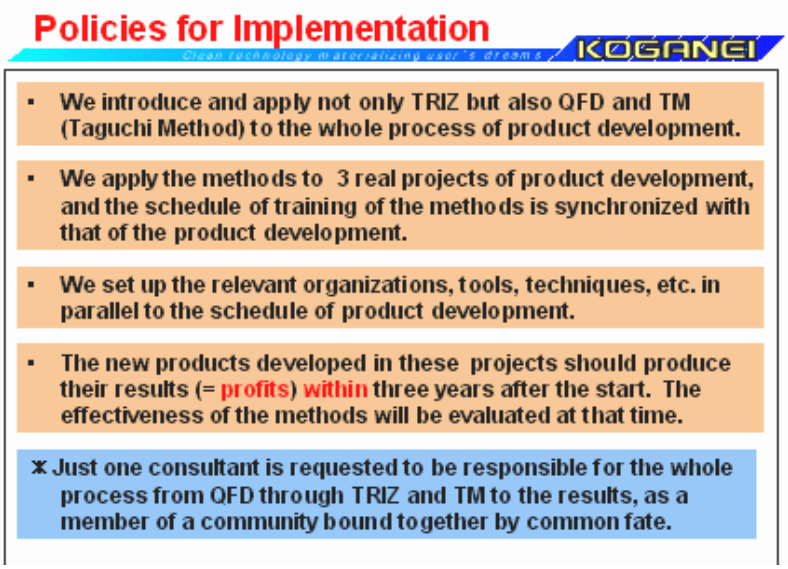
"Our company is a manufacturer having 800 employees for producing and selling pneumatic equipments of all kinds. As usual for an SME manufacturer, engineers in charge of product development also have to work in close contact with people for marketing research, sales, production, prosecution, etc. and have to manage all of their catalogue products of about 300,000 types. And from the management they are requested the results rather than the processes. Under these conditions, we have started to innovate our product development process since October 2006."

The slide (see right) is the contents of the presentation.



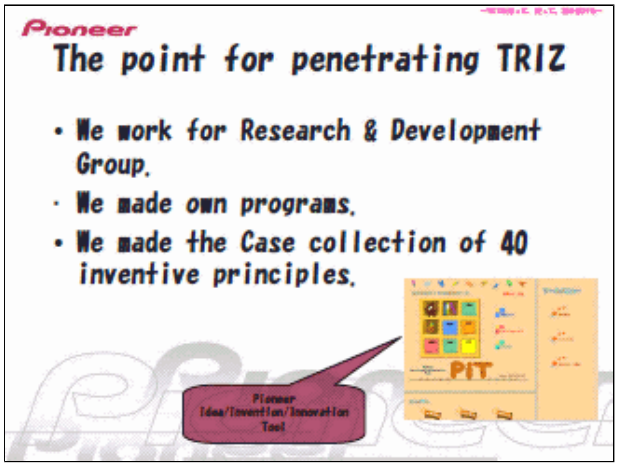
Their "Policies for Implementation" is most interesting in their presentation. The

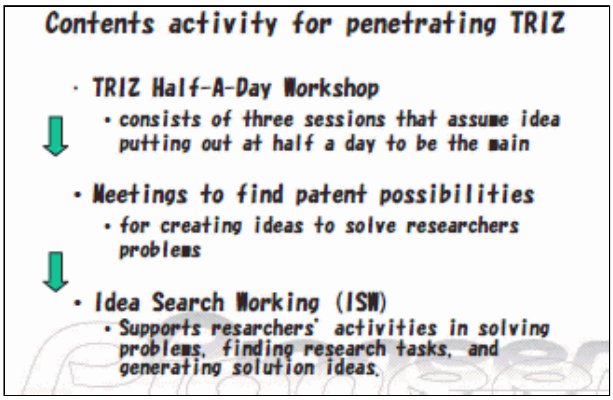
management and a group of engineers met TRIZ (and other process innovation) consultants and were convinced to start implement them. They chose to implement QFD, TRIZ and Taguchi Method along the course (3 years) of three experimental projects. They have chosen only one consultant to lead all these methods together. The methods were trained to a large number of engineers and were applied to the experiment projects. This trial has carried out nearly 2 years and leaves one more year. The presentation was done vividly by the engineer group, not the consultant.

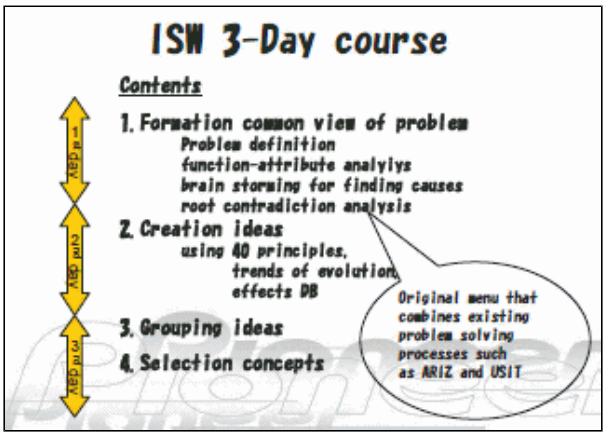


Fumiko Kikuchi and Akio Fukushima (Pioneer Corp.) [P-A3 #39] gave a Poster presentation with the title of "**Introduction to ISW (Idea Search Working) Activities: Learning, Applying and Penetrating TRIZ**". I will quote the Abstract, and (all) the three slides (printed in English).

> Three years ago, we built a basic plan of making TRIZ learned, applied, and penetrated among the researchers/engineers in the R&D Division of Pioneer Corp. In the initial stage we got TRIZ consulting by IDEA, Inc., attended at 2-Day USIT Training Seminar, attended at Systematic Innovation Seminar by SKI, and so forth. By learning TRIZ in these various activities/opportunities outside our company, we have been trying to understand the essence of TRIZ and to apply TRIZ to real problems in our company. We have first organized and facilitated "TRIZ Half-A-Day Workshop" with 11 sections in our R & D group respectively. Then we have used TRIZ in the meetings to find patent possibilities. This year we started our new program, Idea Search Working (ISW), for supporting researchers' activities in solving problems, finding research tasks, and generating solution ideas. In this paper we are going to report some history, contents, and future plan of our TRIZ promotion programs.







Noritaka Nakayama, Takashi Syakuno (Konica Minolta Technology Center, Inc.) [P-B6 #40] gave a Poster presentation on "**Practices of Applying TRIZ/USIT in Konica Minolta Technology Center, Inc.**" The Authors' Abstract is quoted here:

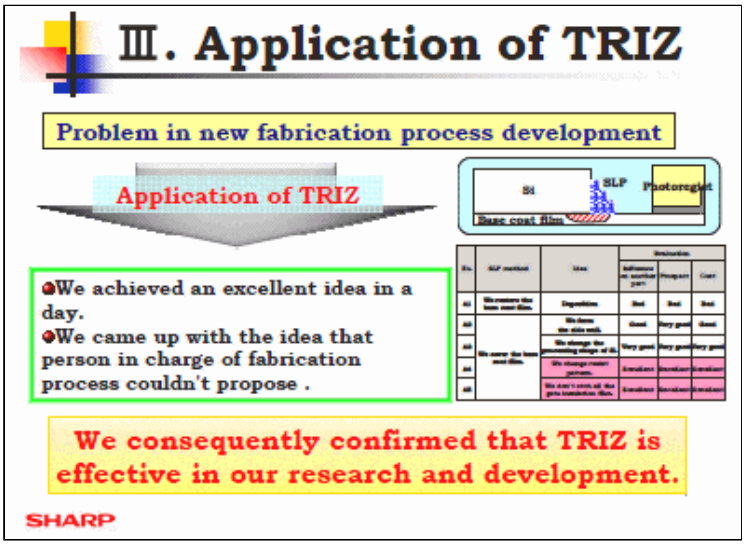
> As a step for promoting TRIZ/USIT in Konica Minolta Technology Center, Inc., we have introduced a new approach in the education to the freshmen joining our company in 2007. We usually give to freshmen 'basic educational program' just after joining and then area-dependent 'technical program' after being assigned to their sections. In addition to these basic training-programs, we have introduced a new course of 'on-the-job training' of the three development methods, i.e. QFD, TRIZ (especially USIT), and TM (CAE). For the purpose of making the education useful in their real practice, we gave Workshops to freshmen and their mentors together. For the part of USIT, the course contains a lecture and half-day Workshop, individual theme-consulting meetings, and individual follow-up supports. We will report some effects and problems as the results of this educational training program.

Shuji WAKAIKI, Koichirou ADACHI and Hiroshi KOTAKI (SHARP Corporation) [P-B3 #28] gave a Poster presentation on "**Practical Application of TRIZ to Novel Electrical Devices Development**". This presentation attracted many visitors in the Poster session, but unfortunately only 4 slides are translated into English. The Authors reported their experiment of examining the effectiveness of TRIZ (especially in the form of USIT) in their actual jobs. They have chosen a real problem which was solved recently by an engineering group in charge. Without telling the solution, a group of engineers were formed for one-day workshop for solving the same problem. The group was composed of two fresh engineers (of first year and of second year), two engineers of different fields, two engineers in the specialty, and a person who is familiar with TRIZ & USIT.

The problem examined is related to the semiconductor process. At first they tried to consider the whole process of the problem but soon found it difficult. So they picked up the individual problems in the process and tried to consider about them closely. For example, during the HF etching process the base coat is undesirably eroded; and this fact later causes the electrical leakage and gives poor electrical characteristics. After identifying the essence of problems like this, the group analyzed the problem with space- and time-characteristics analysis. On these bases and with the use of SLP, the group have generated a large number of solutions, which are written down in Post-It Notes without criticizing. Then the solution ideas are hierarchically classified and evaluated with the criteria of usefulness (and no harm), realizability, ease of implementation, etc.

The results of this experiment is summarized by the Authors in the slide shown at the right.

They have generated a large number of ideas of solutions. Among them there was the solution which was previously obtained by the specialist group in charge after 3 months of work. As shown in the slide, the TRIZ/USIT group have come up with a lot of ideas; some of them are so unique that the engineers in the specialty area would not be able to generate.



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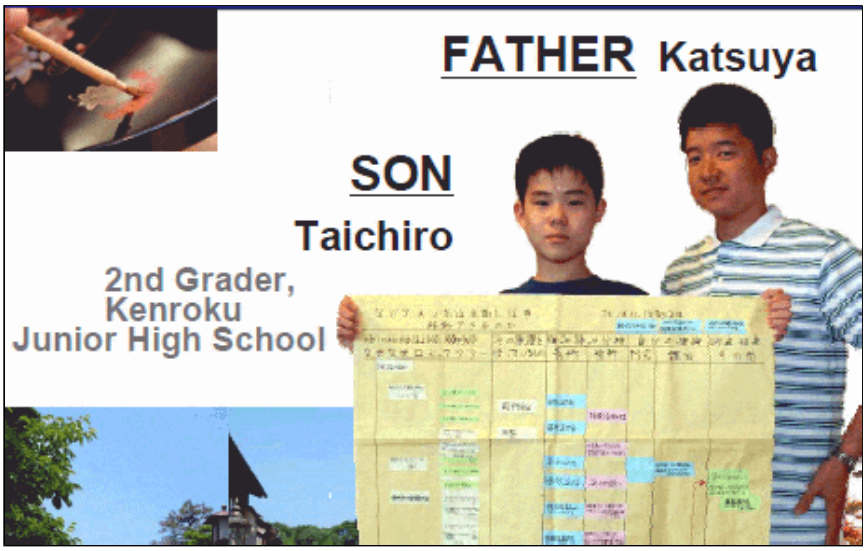
8. Usage of TRIZ in Education and in Academia

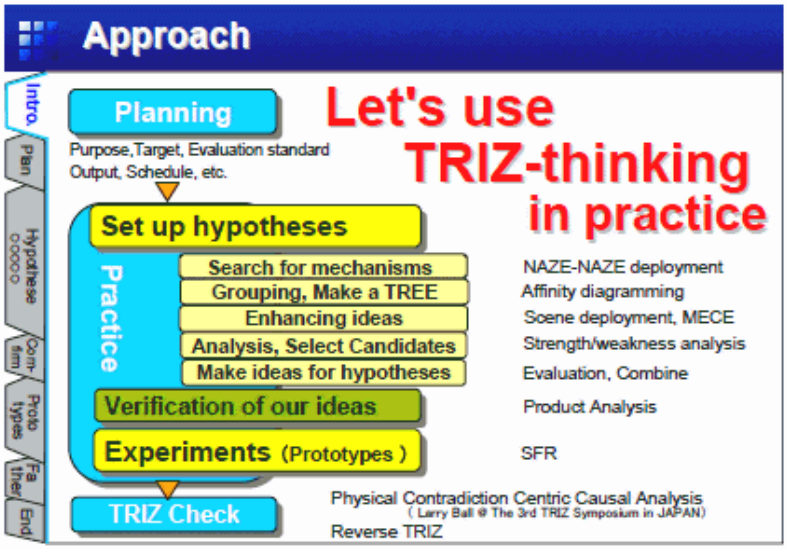
Taichiro Miyanishi (2nd Grader, Kenroku Junior High School /Son), Katsuya Miyanishi (/Father) [O-1 #10] gave an amazing, enjoyable Oral presentation with the title of "**Why Water Striders can stand and slide on the Water?: A Summer Homework by Son and Father with TRIZ**". The Authors of this presentation is shown in the following slide. The top author is a school boy of age 12-13, and the second author is his father, an engineer working for an IT company.



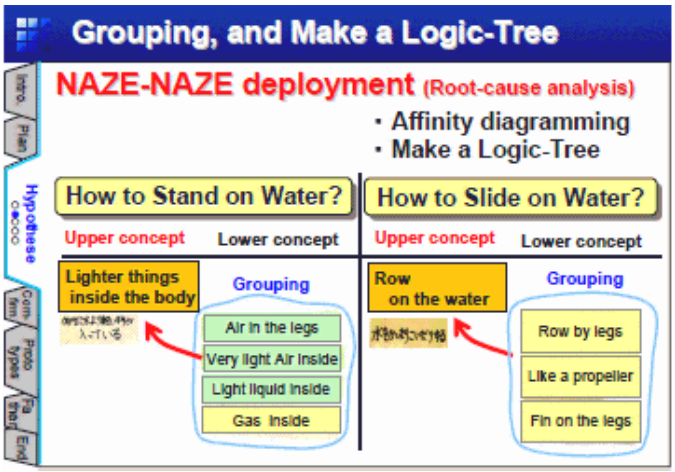
The Father learned about TRIZ only half a year before this story started. Let's read the whole story in their Abstract (2/3 parts) first:

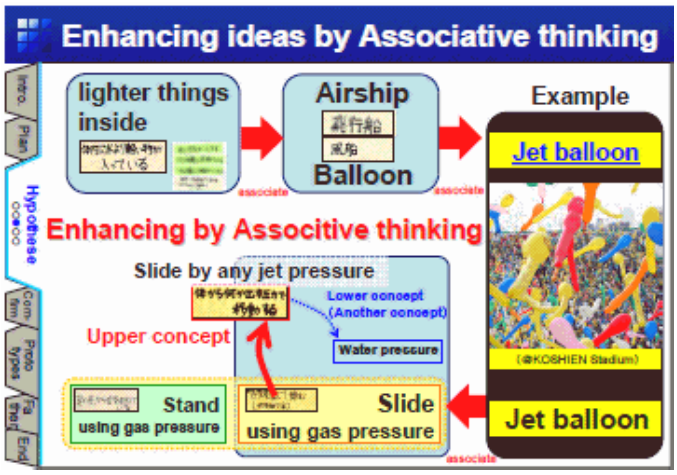
> Last summer, Son in the 1st grade of a junior high school said: "Why can the water striders stand and slide on the surface of water? I want to study about it as my summer homework." This was the start of the present work, carried out by Son and Father together. We will report our process of research on water striders worked together especially with guidance of TRIZ-thinking by father.
>
> The following TRIZ tools were used: "Searching for mechanisms and setting up hypotheses": "NAZE-NAZE deployment (Root-cause analysis)" ,"Scene deployment", "Strength/weakness analysis", "Making conceptual prototypes for trial and verification", "Product Analysis", and "SFR (substance-field resources)".

Their approach, guided by the Father, is quite systematic and yet unique as shown in the following slide. They did NOT go to the library first NOR observe the insect with a magnifying glass. But they first tried to think of possible mechanisms as hypotheses , i.e. just like speculating the insect's inventions.

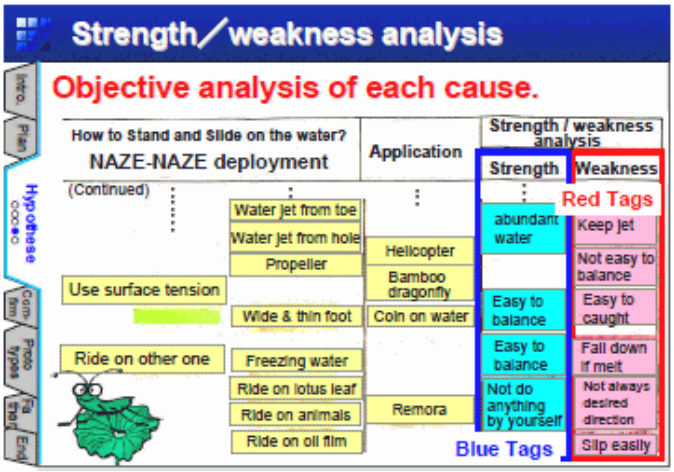


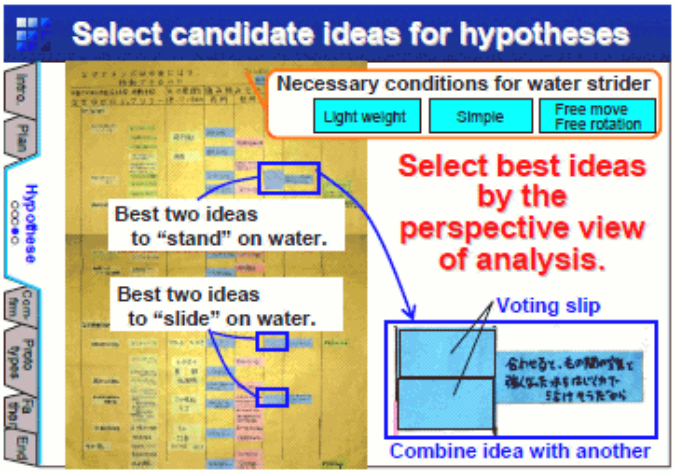
The presentation slides are well organized and rich in contents. Thus I have decided to show the Authors' logic by using quite a number of slides (extracted from 32) without inserting much explanation. They first tried to list up many possible mechanisms, and then classified them into groups and formed a tree structure. And they enhanced such ideas of possible mechanisms, by using associative thinking and imaginative scene thinking.

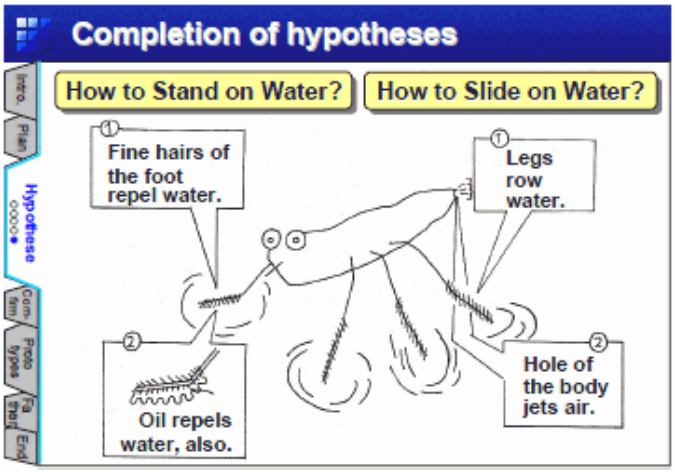




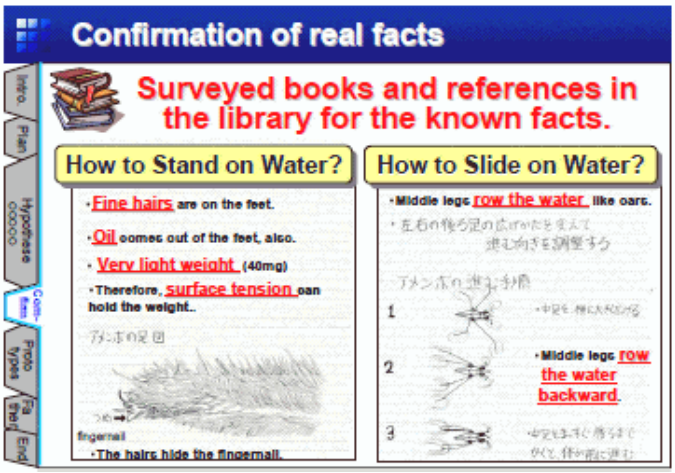
Then they checked the ideas with respect to their strength and weakness, and selected candidate ideas for building up their own hypotheses. They finally selected 4 ideas (of possible mechanism) as their hypotheses for the water striders to stand and slide on the water surface.

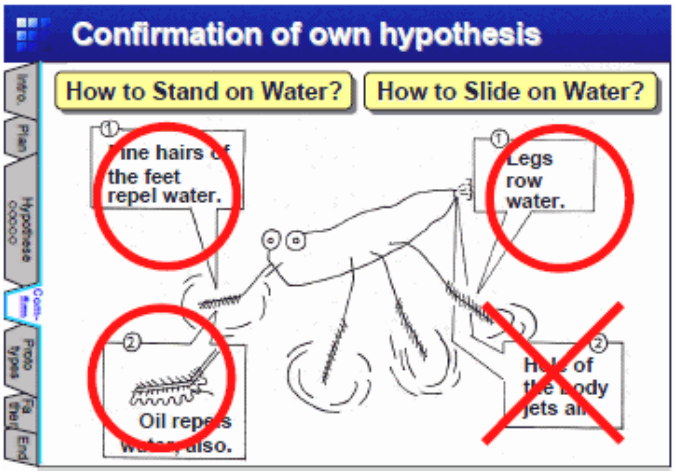




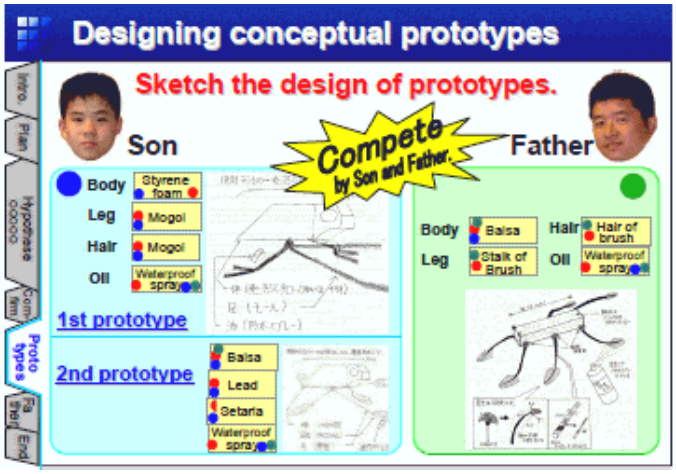


At this stage the Authors went to the Library to survey the facts known about water striders. Among the 4 hypotheses which were built from their reasoning, three hypotheses were confirmed with these references.

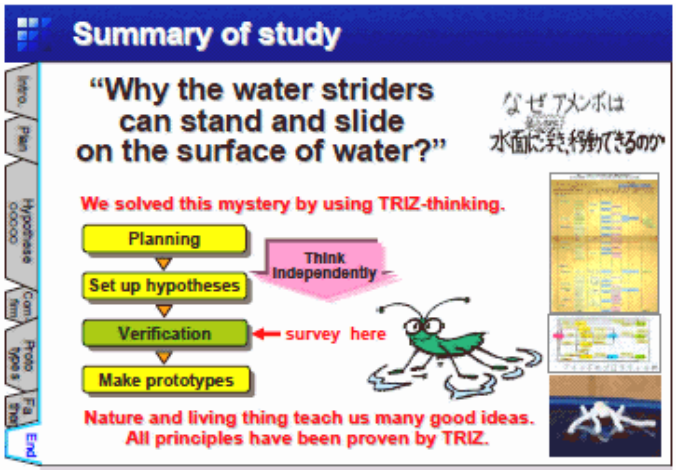


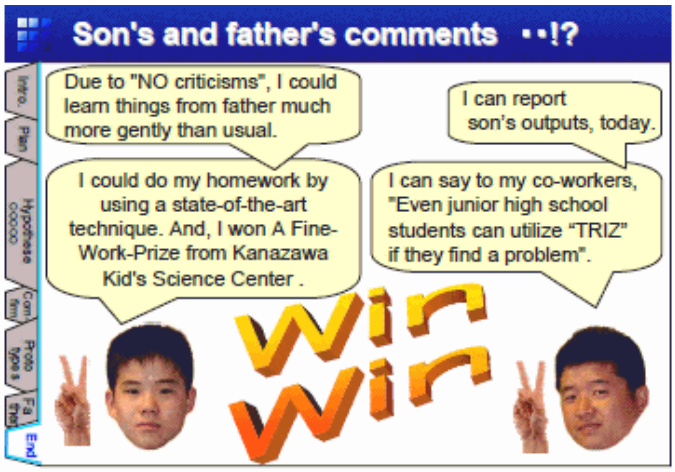


They further went ahead to design and build prototypes by using materials close at hand in their home. Their prototypes stood on the water as shown by the photos in the slide.



The Authors summarize their study and made comments, as shown in the slides below.





Now as the conclusion, we would like to read the last 1/3 part of their Abstract and then the slide of Conclusion and Proposal.

> This work received a favorable evaluation inside and outside the school. A-Fine-Work-Prize was won from Kanazawa Kids Science Center in the point of "Interest and scientific search to a familiar mystery". In the current era of children's "Losing interest in science" and "Spending much time in Web search", I wish children get familiar with TRIZ-thinking in the elementary and junior high school days. I wish they enjoy TRIZ-thinking, which cultivates their "Inquisitive mind" and "Ability to think voluntarily".

*** As you have read, this presentation is really wonderful. Taichiro Miyanishi, of age 12-13, is the genuine top author of this presentation and worked on this project with much interests and joy. Though he could not attend at the Symposium because of his school, he gave a short Video presentation in the conclusion part of the presentation. The human relationship in the family is warm and productive; this is of course a basis of this work. The full version of the presentation slides (both in Japanese and in English) will be posted in this Web site in a couple of months.

*** The approach of this work is very interesting from the view point of educational method. The easiest, hence not so deep, way is to read books (or search in the Internet); good teachers would not advise this way. Probably the standard and good way is to observe the water strider closely, on the surface of water of a small stream and then on the surface of water in a tray on a table, and finally under the magnifying glass while holding the insect with tweezers. This observation approach tries to find the specific means invented by the insects in the nature. The present approach, on the other hand, tries to think of various methods by ourselves, or tries to invent many methods for the insects. This trial has much stimulated the interests of the kid.

*** Seeing this from another view, this work is not a problem solving. The Authors use 'Naze Naze Tenkai' (or Root Cause Analysis). But actually they are seeking not for causes but for possible methods. Thus the process is not an analysis but an idea generation. (Even though the Authors use functional analysis etc. in the slides which I skipped here,) the general approach is the direct idea generation enhanced with grouping, associative thinking, scene thinking, etc. Such an approach seems productive in this case.

Paul Filmore (University of Plymouth, UK) [O-6 #35] gave an Oral presentation on "**A Comparison of the Problem Solving and Creativity Potential Shown in Engineers using TRIZ or Lean/ 6 Sigma**". This paper is an extension of his paper on "Highly effective engineers" presented last year in our Japan TRIZ Symposium 2007 and also his TRIZCON2008 paper.

On the basis of surveying many references and his education experiences, the Author identified (in the 2007 paper) the key attributes to be highly effective engineers who can break his own 'Mindsets' and be creative. The slide, shown right, summarizes the 8 key characteristic/approaches demonstrated by highly effective people. This table shows the references of such key characteristics.

*** It is important that the concepts of 'highly effective people' and their key characteristics have been derived on the bases of works of many authors and in the very wide scope. The width of this scope seems to be essential to understand the significance of the present paper.

Key characteristics/ approaches	Author
Seeing the whole rather than the parts/ Visioning	Kelley 1999 (perspective), Meier 2007 (Habit 2 & 7)?, Elkins & Keller 2003 (boundary scanning; transformational leadership: creating a vision), Covey 2004 (Synergise), Box 1: Senge & Austin, Dung (1997)
Valuing difference	Covey 2004 (Synergise: particularly related to people)
Aspire above conformity	Mullett 2002
Being aware of our assumption	Meier 2007 (Habit 1)?
Developing win-win solutions	Covey 2004 (Think Win/Win)
'Thinking outside the box'	Elkins & Keller 2003 (view problems from new perspectives; idea generating)
Looking for 'breakthrough' c.f. incremental innovation	See section 3
Risk taking	Elkins & Keller 2003 (leader support of risk taking; project champions)

Table 1: Key characteristics/ approaches demonstrated by highly effective people that may be related to 'breaking mindsets', Filmore 2008.

Then the Author lists up TRIZ tools and explains how they help us break mindsets so that problem solving becomes easy. This table may be useful for us to understand TRIZ more, and for us to explain TRIZ to new people.

Table 2: Initial ideas as to how TRIZ helps to break mindsets so that problem solving becomes easy.

TRIZ tool/ approach	Points helping in breaking mindsets
Resources and Constraints	* Helps understand and define the problem, and that everything available may be a resource
Functional analysis	* See the problem visually/ holistically/ overview as a system of interactions. * Understand relationships and the different types of interactions e.g., excessive, harmful, insufficient etc. * Identifies intangibles e.g., missing links that need to be explored.
Ideal Final Result (IFR)	* Balancing trade-offs is a limited way of thinking. Start with the ideal and work backwards to a practical position. * It helps identify the benefits. * Some things are free! NB these may be unused resources etc. Believe it!
Contradictions	* Do not use the word 'problem'. Defining a contradiction in terms of an improving and worsening pair(s) makes the issue seem more manageable. * Formulate the contradiction in terms of space or time etc. further helps to open possibilities of understanding and so by reduce mental blocks.
The Matrix	* A great resource of solution triggers * Brainstorm, or use other creative approaches e.g. using Synetics, starting with these given triggers
Trends	* There is a (physical) limit where putting in large effort will get very little reward i.e., little increase in efficiency/ ideality etc. * Other industries have jumped s-curves already, so why reinvent the wheel? * The difference between incremental thinking and breakthrough thinking (i.e., jumping s-curves). * Which trends have you not considered as being relevant? * Shows us where and when to invent.
9-Windows	* Gets one away from the 'present' and 'systems' level thinking, by forcing one to consider the past and future and sub and super system level. * Helps to zoom in and out of problems e.g., identifying invisible problems and design points.
Problem Hierarchy tool	* Elucidates why you want to solve the problem and what is stopping you etc. * Helps define broader and narrower problem levels
Trim	* Helps to re-simplify a system, as the solving process often adds more complexity e.g. parts. Trim solution to same functionality.

Combining the above two tables, the Author shows Table 3. For the key characteristics and approaches demonstrated by highly effective people, TRIZ provides various tools and methods as shown in this table. It is remarkable that TRIZ has so rich contents for all the 8 keys. As TRIZ learners and practitioners, we should master these TRIZ tools and obtain the capabilities of thinking in these manners.

Table 3: TRIZ tools etc. related to key characteristics/ approaches demonstrated by highly effective people.

Key characteristics/ approaches	TRIZ tool/ approach
Seeing the whole rather than the parts	IFR (Ideal Final Result) tool, Functional Analysis
Valuing difference	Being a creative TRIZ practitioner can make one have this awareness as one is always looking for difference.
Aspire above conformity	IFR tool. NB Being a TRIZ practitioner by definition, in the present climate, means aspiring to seek/ learn better tools
Being aware of our assumption	9 Windows, Trends, Resources tool
Using all resources available	Resources & Constraints tool
'Thinking outside the box'	Trends, 9 Windows, Functional Analysis, Smart Little People, Space-time-interface-cost
Looking for 'breakthrough' c.f. incremental innovation	IFR tool, Trends
Developing win-win solutions	Contradictions, Matrix, IFR, Trends
Risk taking	IFR, trends. NB TRIZ practitioners are looking for highly 'unusual' solutions, if using all the tools. Risk in the solution space is thus a common occurrence in practice. Filmore 2008.

The latter part of the present paper is the report of the Author's inquiry research of the methodologies adjacent to TRIZ. He sent the inquiries to some contact persons in manufacturing industries in UK and USA and asked to pass the inquiries to Lean and Six Sigma practitioner to fill in. The following is the explanation of the inquiries taken from the Author's slide:

> The questionnaire simply asked the Lean or 6Sigma practitioner to identify:
> (a) Tools that had mindset breaking potential, i.e., Table 2 previously.
> (b) Relate the tools to the previously identified 'highly effective engineer key attributes' i.e., Table 3 previously.
> (c) Give a brief background to their company implementation of Lean/ 6 Sigma

Concerning to the results of the inquiries, I will quote the latter half of the Author's Abstract:

"The results show that Lean Six Sigma has the closest tool set/ approach with that relevant for 'highly effective engineers', with Lean and then Six Sigma of lesser match. It is shown that even with Lean Six Sigma, there is a place for a TRIZ gateway dependant on problem type, and a recommended implementation is suggested here. It is also noted that with all methods, some of the TRIZ tools are relevant to help with the general problem solving stage of any process. Overall in this initial exploratory investigation, TRIZ appears to offer great problem solving and creativity potential for engineers than Lean/ Six Sigma. "

Lean Six Sigma result example

This organisation has a combined Lean Six Sigma approach which is a global top down and bottom up role out.

Table 6

Key characteristics/ approaches	6Sigma tool/ approach
Seeing the whole rather than the parts	Lots of Tools can be used but I would start with "Big Picture Mapping" then use "Value Stream Mapping" in most cases
Valuing difference	Impact Matrix, Pugh Diagrams, Value Stream Mapping ect…
Aspire above conformity	Kano
Being aware of our assumption	DMAIC project management cycle
Using all resources available	Good project management
'Thinking outside the box'	6 Thinking Hats
Looking for 'breakthrough' c.f. incremental innovation	DMEDI/DFSS Tools
Developing win-win solutions	DMAIC project management cycle
Risk taking	Kai-Zen low hanging fruit

The Author presented his conclusion in two slides. Skipping the first slide for saving the space, the second slide of conclusion is shown here. This is a very encouraging message for us to learn and promote TRIZ more.

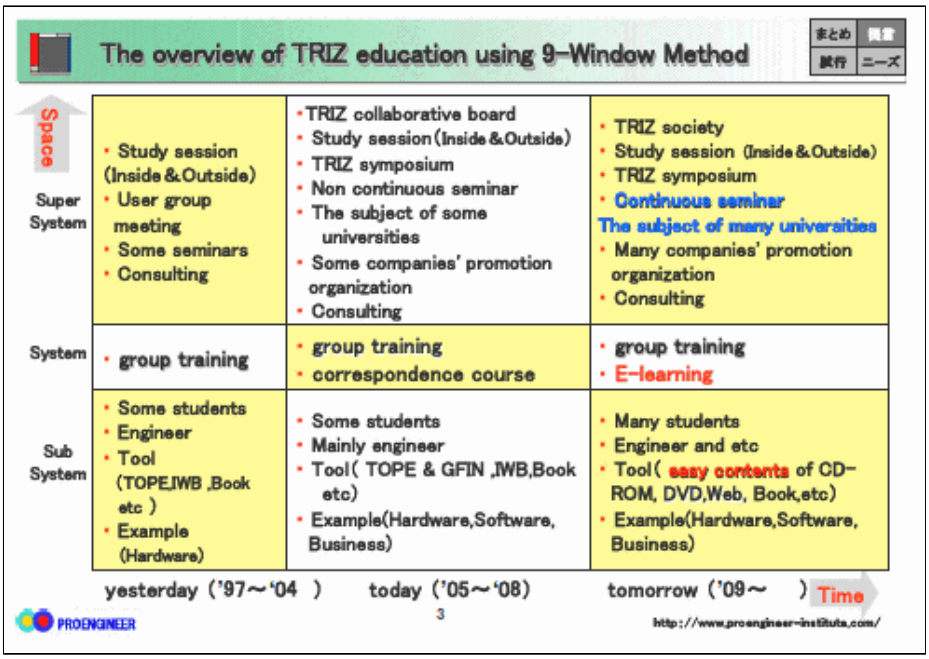
- This implies that TRIZ has very serious advantages that need to be taken seriously by the professional engineering community and should form part of professional development (CPD) for engineers in general.
- There is need for future work to back up these preliminary results. This will need in-depth interviews.
- TRIZ thus has still yet to see its time of fruition i.e., general acceptance in the portfolio of skills required for highly effective engineers.

*** It takes time for us to understand the significance of someone else's work. By reading three papers by the Author, Paul Filmore, I think I now understand the significance of his approach. In his second paper, TRIZCON2008, I noticed the work of Steven R. Covey "The 7 Habits of Highly Effective People". The "7 Habits" series by S. R. Covey is really a best seller (a million-seller even in the Japanese language), I learned. I was very much impressed with Covey's book. Actually I read (in Japanese) Steven Covey's original "7 Habits", Sean Covey (i.e., Steven Covey's son) "7 Habits of Highly Effective Teens", and also "Records of 7 Habits Teaching in an

Elementary School" written by Naohisa Watanabe, a Japanese teacher. I have just started teaching "7 Habits of Highly Effective Teens" in my Seminar Class for university freshmen.

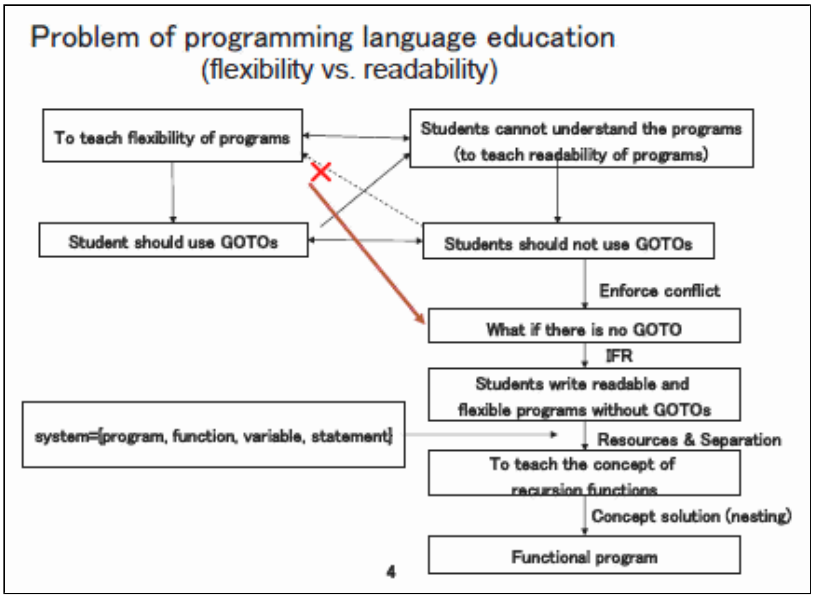
Shigeru Kasuya (Pro Engineer Institute/Yamaguchi University) [P-A1 #05] gave a Poster presentation on "**The overview of TRIZ education using 9-Window Method - yesterday, today and tomorrow: The utilities and future perspective of group training, E-learning and correspondence course**".

The Author gave an overview of TRIZ education in Japan, using the scheme of the 9 windows. The Author has experiences of promoting TRIZ as the leader of the users group in an industry, teaching TRIZ and related methods to university students as a part-time lecturer, and training engineers as a consultant. As shown in the 'Tomorrow' column of the slide, he emphasized the followings: Continuous training seminars in industries, Classes in many universities, Group training with real, relevant problems, E-learning of many engineers, Easy contents of the methodology, and Case studies. Without implementing these, TRIZ will not be penetrating well, he warns.



Jung Suk Hyun, Chan Jung Park (Cheju National University, Korea) [P-B7 #47] gave a Poster presentation on "**Butterfly Bridge Model as a Simplified TRIZ**".

The Authors' model is illustrated in the slide on the case of problem of programming language education. The expression of the contradiction at the top of this procedure is named 'Butterfly Bridge Model' by the Authors. The Authors used this logic in explaining the significance of the functional programming to secondary school students.

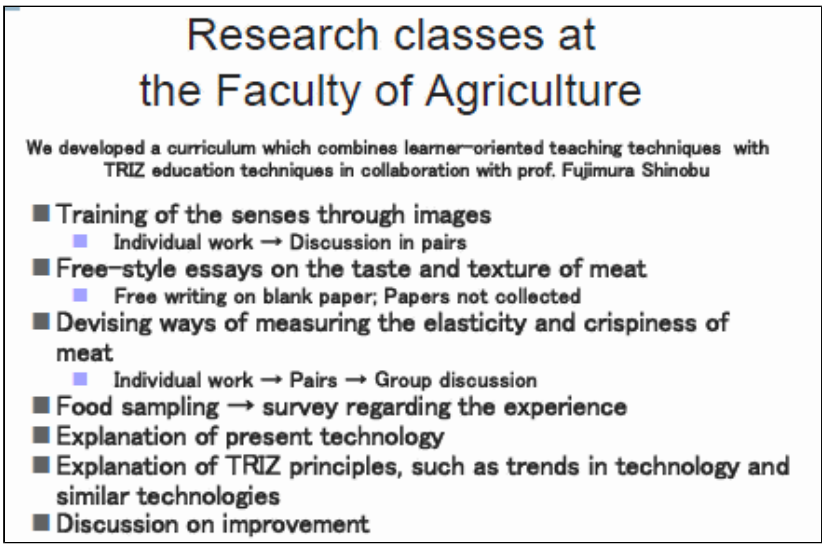


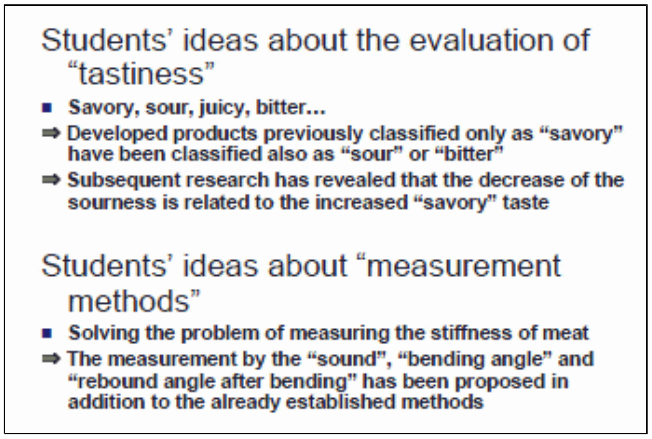
Sachio Matsubara (Niigata University) [O-23 #25] gave an Oral presentation with the title of "**The utilization of TRIZ in university education**". The Author's Abstract writes:

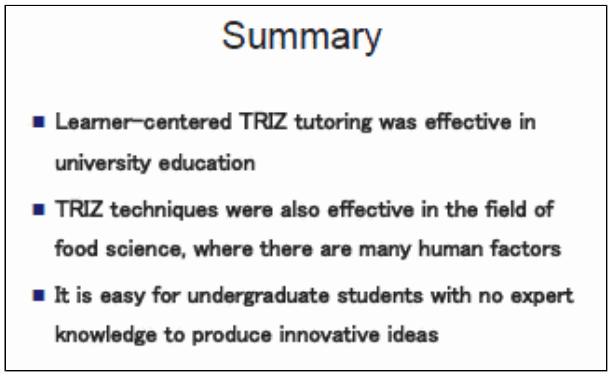
> This Paper is devoted to consideration of the utilization of creative thinking method in university education. The purpose of our research is to increase students' creativity by utilizing the creativity thinking method, such as TRIZ, together with Leaner-Centered Teaching method. The technical theme for our research course is improvement of estimation standard and estimation method of oral sensation.

The Author has been conducting the research classes in the Faculty of

Agriculture for these three years. The curriculum they developed is shown in the slide. The principal subject they used in the class is how to evaluate and measure tastiness of meat (beef) in an objective way. By introducing TRIZ methods for solving such a human-sense related problem, the students generated more ideas, the Author writes. The results and the summary are expressed in the following two slides.



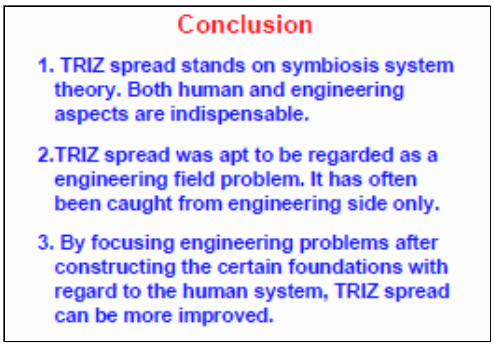




Mitsuo Morihisa (Current: SKI, Former: Kyoto University), Hiroshi Kawakami, Osamu Katai, Takayuki Shiose (Kyoto University) [O-21 #23] gave an Oral presentation on "**Human-Oriented Consideration for the Popularization of TRIZ —From Viewpoints of Symbiotic Systems Theory and Dale Carnegie's Approach—**". The Abstract by the Authors are quoted here.

> TRIZ is going to raise expectations for the technological breakthrough, as it has richer contents on invention and creative inspirations than any other problem solving methods. In this paper, the benefit of not only the symbiotic systems theory which yields each full inherent characteristics with harmonious symbiosis among Man, Systems and Environment but also the pioneering practice of Dale Carnegie in the field of both adult education (andragogy) and human relations is shown to the fulfillment of "the human system" for spreading TRIZ.

The Authors refer to Dale Carnegie's long-seller book "The Leader in You" and a recent paper by Peter Schweizer 'No Need for Methods?' Engl Japn (presented at ETRIA TFC 2007) for discussing the human basis of penetrating TRIZ. Skipping the quotes and discussions I would like to show the slide of the Authors' conclusion:



Wolfgang Sallaberger (congelo, Austria) [O-22 #49] gave an Oral presentation with the title of "**Tributes to the Work of Victor Schauberger (Austria 1885-1958) with the Eyes of TRIZ**". The Author is quite unique in his carrier. He has long been an owner chef of his restaurant in Austria. Since 2004 he started to invent a process and its equipment of making prefabricated convenience food of vegetable side dishes as shown in the following slides. He gave a presentation of this work in the ETRIA TFC 2007 and served his food in the dinner time. These dishes are kept frozen, and need only one more step of heating in a steam oven for 6 minutes just before serving.

From the Author I received an email message last April saying that he is coming to Japan to present a paper in the Symposium and is planning to sell his whole restaurant estate for becoming a professional inventor. He says he is currently much interested in the work of Viktor Schauberger, who was a genius from Austria but not well known in the world because of historical reasons.

The following slides show the photo of Viktor Schauberger and his inventions. Schauberger found secrets in water especially in its helix/spiral movement. The logging flume had an oval form in its section and used helix movement of water along the axis of the flume. The plow made of cupper has the special shape of moving (or turning) soil in a helix way.

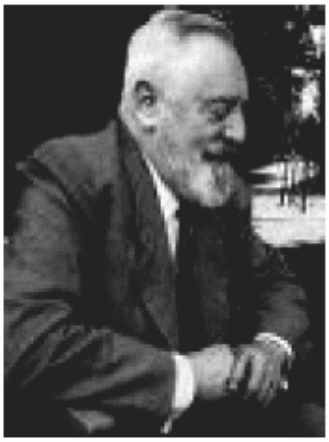


Figure 5. Victor Schauberger

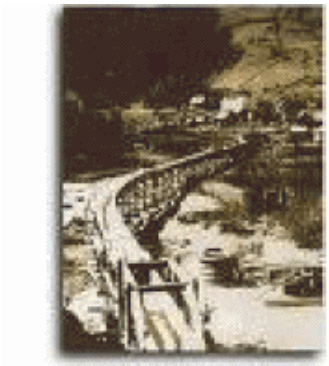


Figure 6. Logging Flume*


Figure 19.Helix Plow

Schauberger invented a home generating plant, which uses helical movement as you see in its shape of pipes. The middle photo is a 'Repulsine', having some special inner design as shown in the right slide; this body flied up very fast and high just like an UFO.


Figure 8.Home generating plant

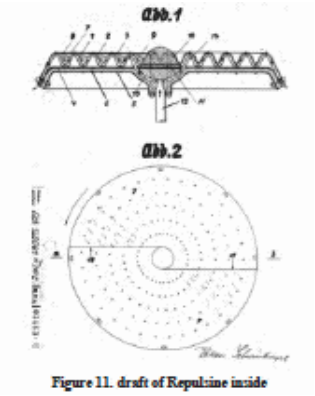
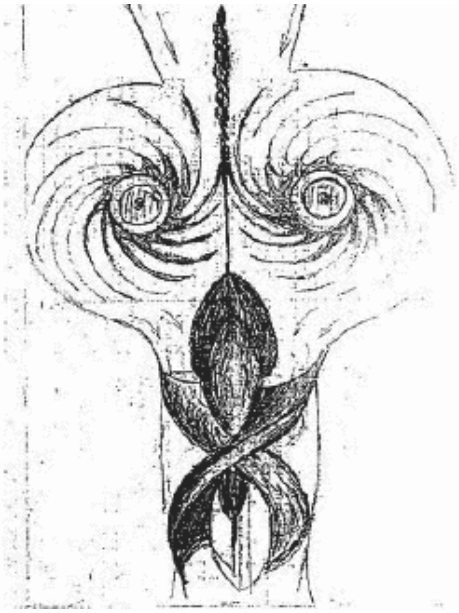


Figure 11. draft of Repulsine inside

The drawing at the left is the 'Trout Engine' invented by Schauberger. He watched a trout in a rapid stream in a forest and found it stays there without any motion and with just a flip of motion it jumps against the stream over the water fall. On the basis of this observation he invented the 'Trout Engine', the Author (Sallaberger) explains. The Author finds some similarity in the design of the nose of locomotive of Japan's Shinkansen. The right drawing is the Author's interpretation of the air stream around the Shinkansen train. The Author believes a lot of possibility of further research and novel innovation by studying Viktor Schauberger's works with the eyes of TRIZ.



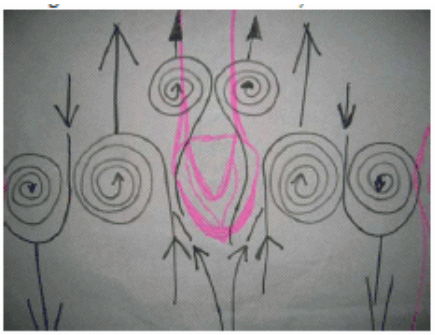


Figure 24.

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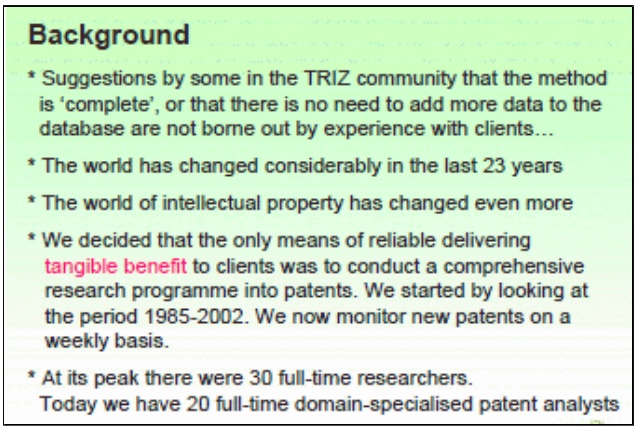
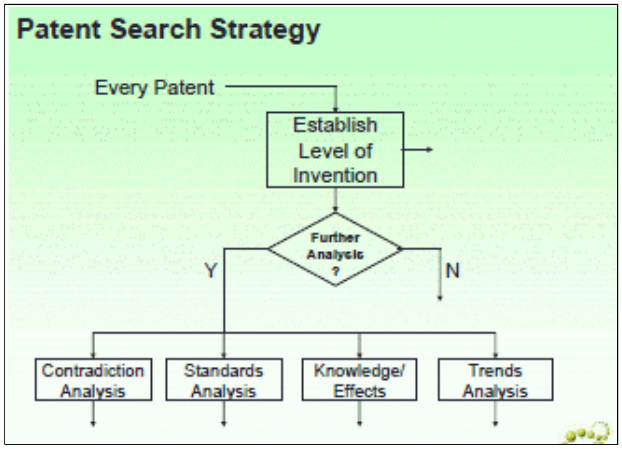
9. Patent Studies and Tools

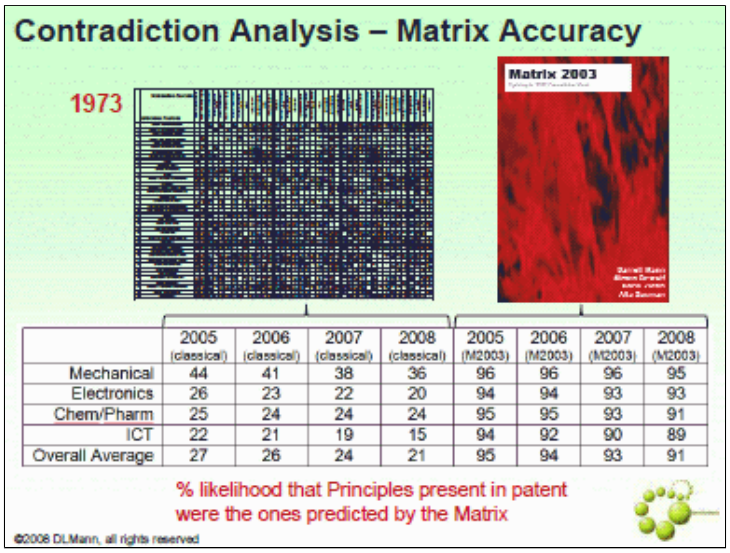
The paper by Darrell Mann (Systematic Innovation Ltd, UK) [O-20 #43] was presented Orally by Paul Filmore (Univ. of Plymouth, UK) with the title of "**Updating TRIZ: 2006-2007 Patent Research Findings**".

This paper is an extension of Darrell Mann's important work of patent research done at CREAX (in 2000-2003) and resulted in his books of "Hands on Systematic Innovation" and "Matrix 2003". The following slide shows the background and aims of this research. The flowchart in the right is the process of investigation of each patent. 20 % of patents are now passed over to further analysis as shown at the bottom.

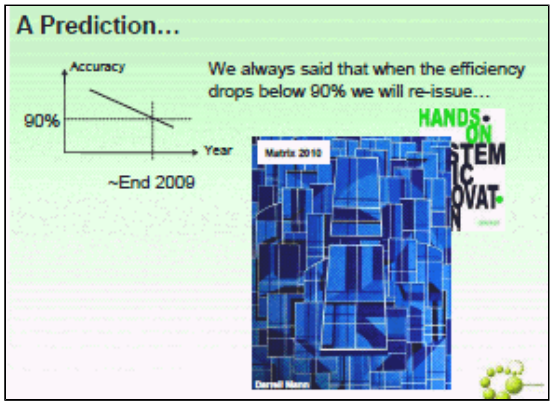




The slide shown below-left is the results of the accuracy of obtaining appropriate Inventive Principles by the use of the problem formulation in Technical Contradiction and then the Contradiction Matrix either built by Altshuller in 1973 or rebuilt by Mann et al in 2003. The survey of the accuracy is based on 100 patents for each year, which were selected quasi-randomly and having 'WOW' ideas from the Author's eyes. The Author recognizes a slight decrease of the accuracy of the Matrix, so he is planning to re-issue the Matrix in the year 2010, as shown in the right slide.

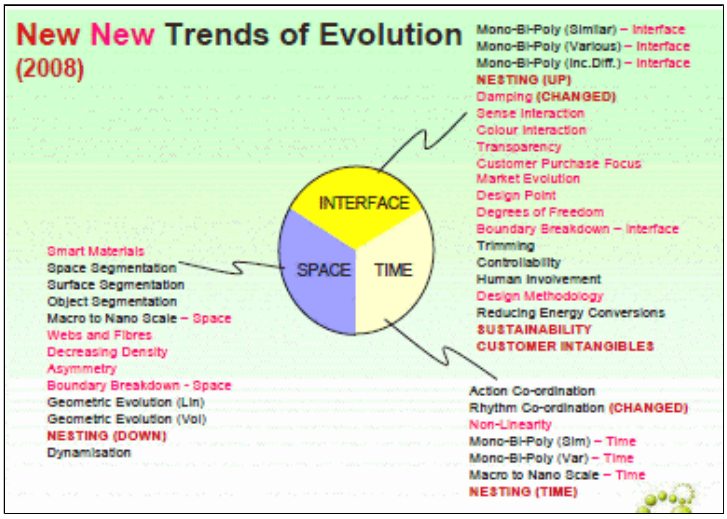


	2005 (classical)	2006 (classical)	2007 (classical)	2008 (classical)	2005 (M2003)	2006 (M2003)	2007 (M2003)	2008 (M2003)
Mechanical	44	41	38	36	96	96	96	95
Electronics	26	23	22	20	94	94	93	93
Chem/Pharm	25	24	24	24	95	95	93	91
ICT	22	21	19	15	94	92	90	89
Overall Average	27	26	24	21	95	94	93	91



The slide (see right) demonstrates another aspects of the research. The Trends of Evolution are recorded and accumulated in this patent analysis. The trends shown in black characters are the ones recognized in the Classical TRIZ. On the other hand, those written in red are recognized in the 2003 research, and those in dark red are recently recognized in the present 2008 research.

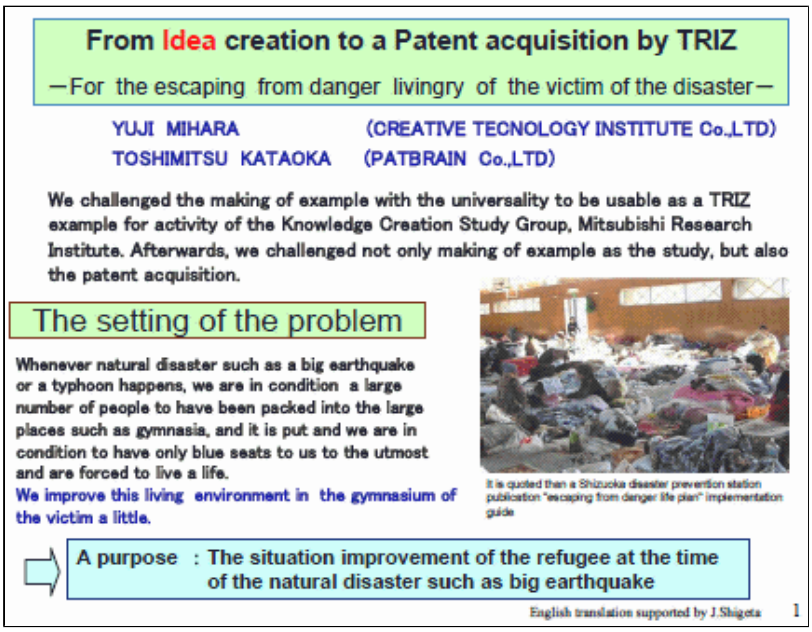
*** It is remarkable that the Author's group is investing much to this basic research work. We appreciate very much the efforts for the work and for the feedback of the results in their publications.



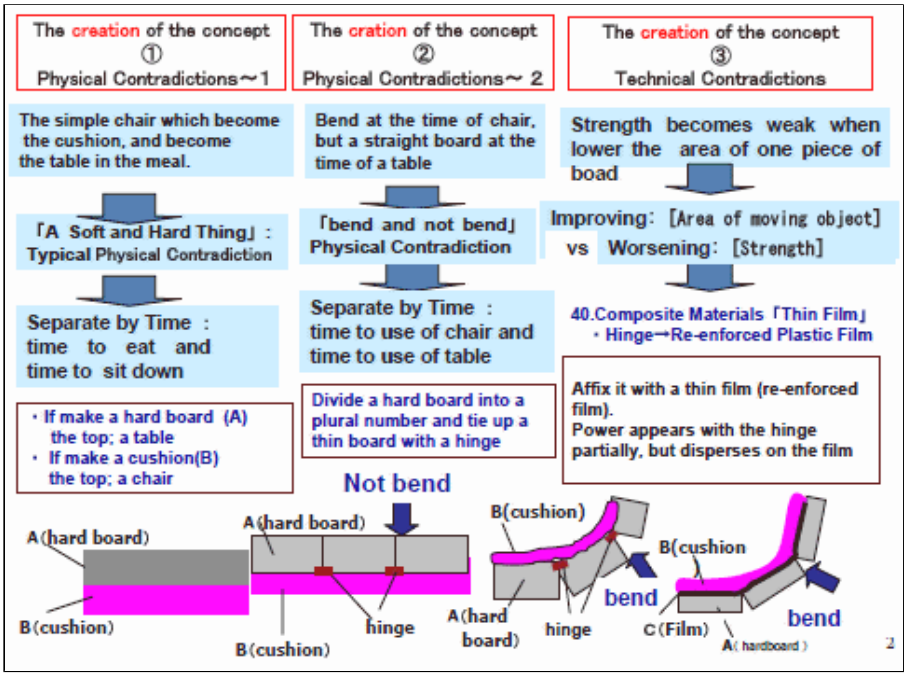
Kimihiko Hasegawa, Toshimitsu Kataoka, Teruyuki Kamimura, Hiroshi Ueda, Mikio Suzuki, Shigeru Suzuki (Intellectual Property Creation Research Subcommittee, Japan TRIZ Society) [P-C2 #14] gave a Poster presentation on "**Invention Analysis through the Patent Journal**". The Japan TRIZ Society currently operates two study groups; one of them is this group interested in the Intellectual Properties. The group started in March 2007, has held several times of group meetings, and currently has about 10-15 active members. They are working together to analyze interesting patents in the Patent Journal of Japan Patent Office. They have established a one-page format for recording the essence of the patent and its interpretation in the scheme of Technical Contradiction. The Inventive Principles suggested by the use of "Matrix 2003" were compared with the solution concepts obtained by the patent inventor. Over 50 patents have been analyzed in this scheme so far.

Yuji Mihara (Creative Technology Institute Co., LTD), Toshimitsu Kataoka (Patbrain Co.,LTD) [P-C3 #21] gave a Poster presentation with the title of "**From Idea Creation to Patent Acquisition by TRIZ: For Improving the Living Situations Just after the Evacuation from Natural Disaster**".

This presentation involves two stages of work. The first stage was the set-up of the problem, solving it with TRIZ, and filing a patent. This stage was achieved by a group (of 5-6 members) in the Knowledge Creation Study Group organized by Mitsubishi Research Institute and presented in 2002 at the Japan IM Users Group Meeting. The work was carried out for the purpose of creating a TRIZ case study publishable as well as patentable. The problem was chosen to make something useful to improve the unpleasant living situations in case of refugee at the time of natural disaster.

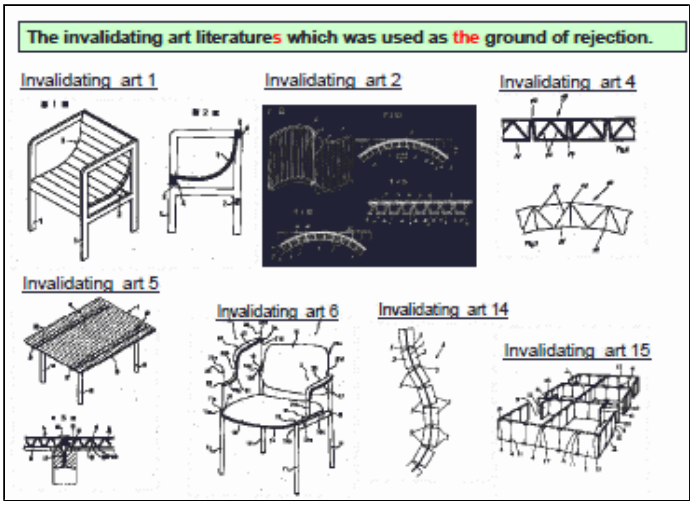


Discussing the needs in such situations, the Authors' group thought of a soft mat on the floor, a chair with a soft cushion, a table with a hard flat top board, a partition board standing by itself and absorbing sound, etc. While thinking of these, they reached physical contradictions of 'A soft and hard thing' and of 'A thing bending and not bending'. With the help of TechOptimizer, they come across the principles of composite materials and thin films. The Group reached the idea as shown at the bottom of the slide. On one side of a thin film several blocks of hard board, linked with hinges one after another, are attached, while on the other side a thick sheet of soft cushion is attached. This thing can bend in one direction but does not bend in the opposite direction.



The solution shown in the above slide was submitted for patent at the Japan Patent Office.

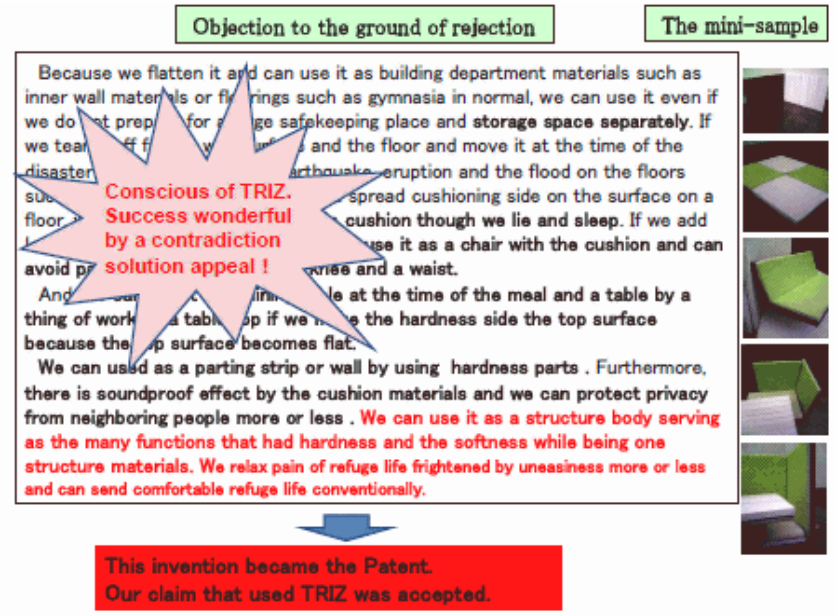
However, the Authors' group received a rejection by the Patent Office, with 16 prior-art literatures, some of which are shown in this slide. There are chairs, tables, and partition boards, etc. of the similar folding/bending capability.



Thus, the second stage of the present work started. The Authors wanted to defend their patent application by overcoming the rejecting arguments.

After some discussion, the Authors decided to rely on the logical power of TRIZ. They argued: "The point of real advantage of the newly invented thing is

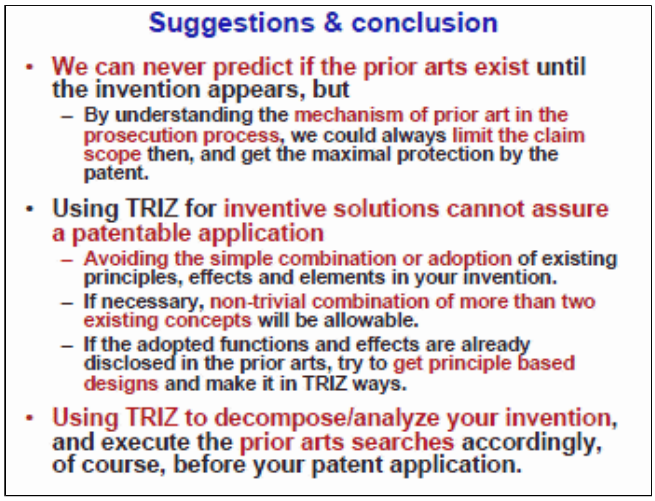
its universality. The thing can be used as a soft mat on the floor, a chair with a soft cushion, a table with a hard flat top board, a partition board standing by itself and absorbing sound, etc. and even in ordinary days it can be used (or stored) as the soft cushion of the gymnasium wall For making such a thing, the contradictory requirements of 'soft and hard' and 'bending and not bending' need to be met in a novel way like the present solution." The Patent Office approved the argument and granted the Authors a patent.



*** This is a nice case study, of not only inventing a thing with TRIZ but also applying and defending a patent with TRIZ. The logic is clear. (The above four slides are the only ones translated into English at moment.)

The paper by Tzu-Chang Chen (Taiwan Textile Research Institute, Taiwan) [O-14 #44] having the title of "**On Patentability of Inventions Facilitated by TRIZ Methodology**" is published in our Proceedings but was not presented in the Symposium due to the Author's absence because of his personal situations. I will quote the Author's Abstract, and his final slide on Suggestions and Conclusions.

> This article aims to enclose the relationship between the inventiveness based on a systematic innovation approach (such as TRIZ) and the patentability based on patent examination procedure (such as MPEP), and will propose a feasible way to improve both inventions and their intellectual proprietary protection. A detailed examination of concepts generated by aid of TRIZ methodologies, their corresponding prior arts and prosecution history is performed. Some conclusions are drawn about the causes of rejection of inventions, and some suggestions are proposed as guideline for effective invention and patent application.



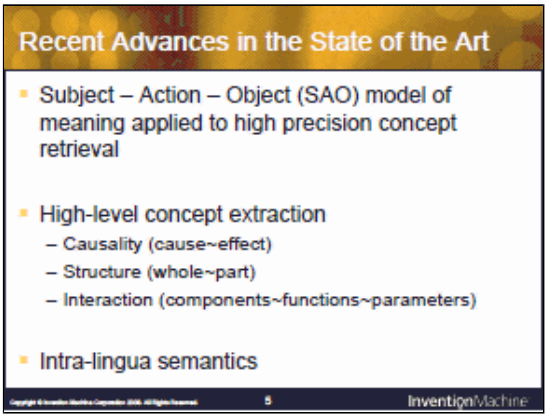
*** This paper has too rich contents for me to summarize using several slides. Please wait for a few months till the full paper and slides are posted in this Web site.

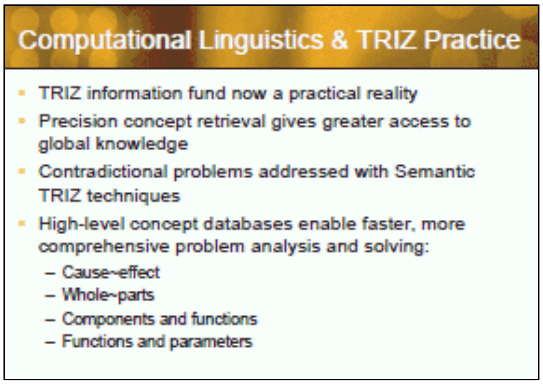
James Todhunter (Invention Machine Corporation., USA) and Kiyoshi Shikakura (Invention Machine Japan) [O-8 #12] gave an Oral presentation with the title of "**Advances in the Application of Computational Linguistics for TRIZ Practice**". The Authors' Abstract is quoted here first:

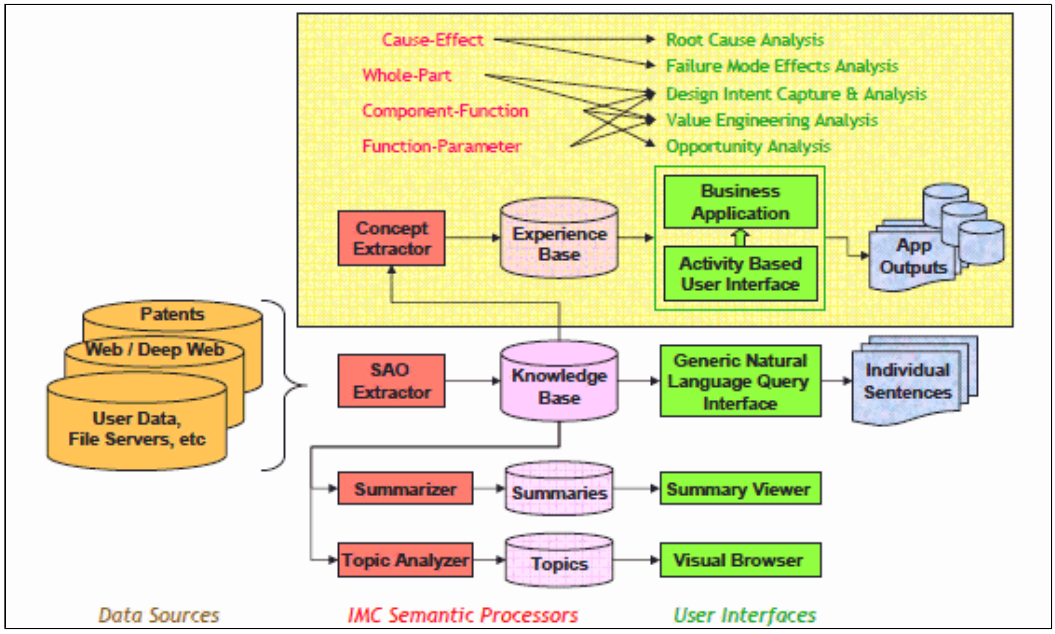
> Altshuller's information fund concept is central to TRIZ. The application of TRIZ relies upon the individual practitioner's familiarity and facility in leveraging knowledge from the information fund. However in practice, engineers are constrained by local knowledge and the psychological inertia that this parochial view engenders. Advances in computational linguistics are elevating the practical use of TRIZ to new heights providing knowledge workers with unprecedented access to the knowledge

that spurs innovation through TRIZ practice. In this session, the state of the art of computation linguistics for TRIZ and problem solving is presented with examples of this application from industrial experience.

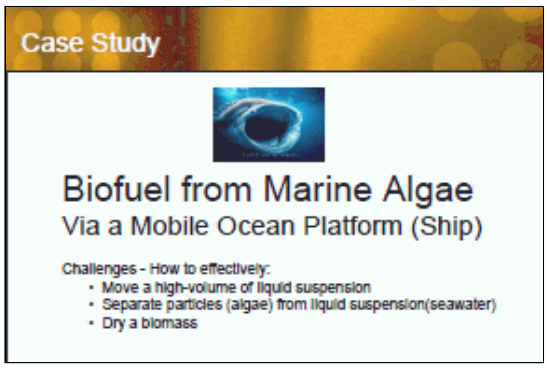
The following two slides summarize the recent advances in the state of the art of computational linguistics and its use in TRIZ practice. Subject - Action - Object (SAO) model is the basis of semantic analysis developed and utilized in the Invention Machine's software tool, 'Goldfire Innovator'. From technical documents like patents, the SAO structures in every sentence are extracted and accumulated automatically, and then various high-level concepts are further extracted. The scheme of extracting such knowledge is summarized in the slide shown below.

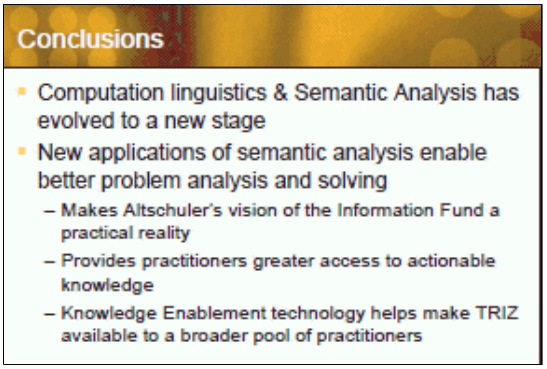






In the presentation the Authors demonstrated the usage of the software by the example of 'Biofuel from marine algae', or, in its essence, how to separate the algae from abundant sea water efficiently. The conclusion is shown in the slide. *** It is difficult to explain this method and software practices here in a short space, I would rather like to post the full paper and the slides later in this Web site.

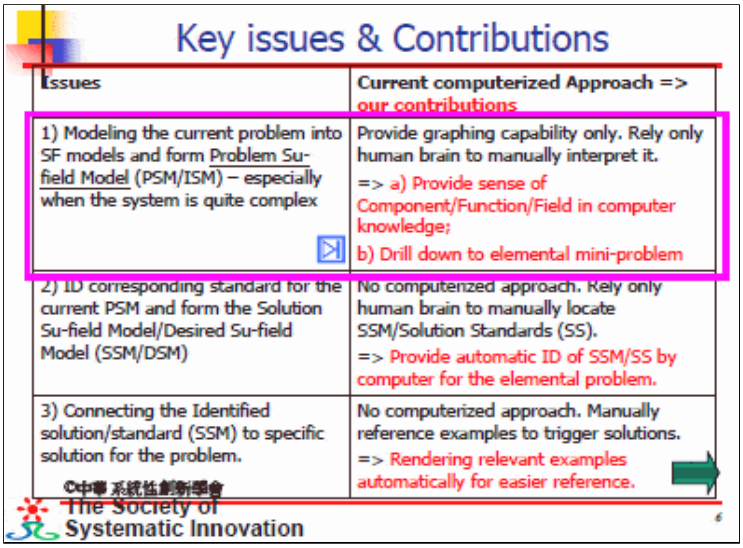




D. Daniel Sheu and David Lee (National Tsing Hua University, Taiwan) [O-12 #20] gave an Oral presentation with the title of "**Computer-aided Problem-solving Assistant for Su-Field Analysis**". I would like to quote the Authors' Abstract first:

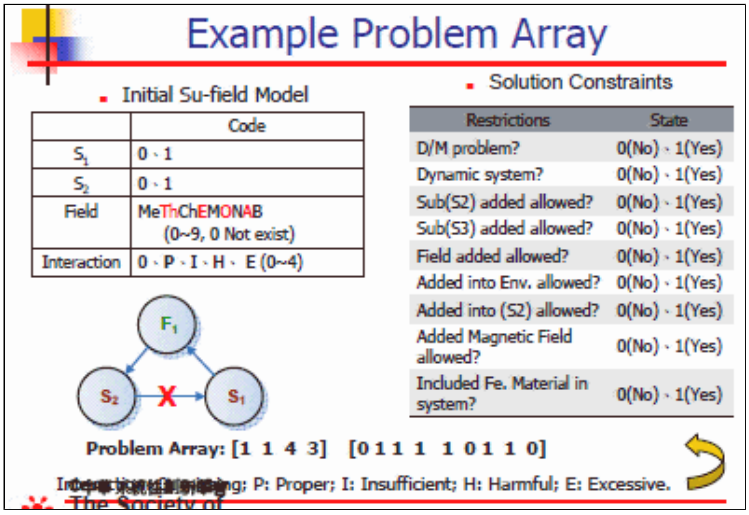
The substance-field analysis with inventive principles is one of the most difficult and less used TRIZ tools although it is reported as among the more likely tools which can generate breakthrough results. The paper established a new coding and su-field based problem solving scheme allowing automatic generation of ISM (Initial Su-field Model) in coded form, intelligent identification of possible corresponding standards, and allowing users to select identified standards and generate solution trigger DSM (Desired Su-field Model) automatically. The system is an Excel-based intelligent problem-solving assistant for su-field analysis. Upon identification of solution triggers, the system will also provide examples to aid human generation of specific solutions given the solution triggers. It will enable a novel user to quickly generate solution triggers without detail knowledge of the su-field knowledge and laborious manual exercise.

The slide shown here summarizes the key issues, current computerizing approaches, and the Authors' contributions (written in red). The first issue is to set up the Su-Field Model of the problem. The Authors' approach is to input the meaning of each component in the SF model. The second issue is to suggest improved Su-Field Models for possible solutions. This process is carried out automatically in the Authors' new computer software. The third issue is to help the users think of specific solutions by use of the suggested Su-Field Model. Authors' new software provides relevant examples for easier reference.

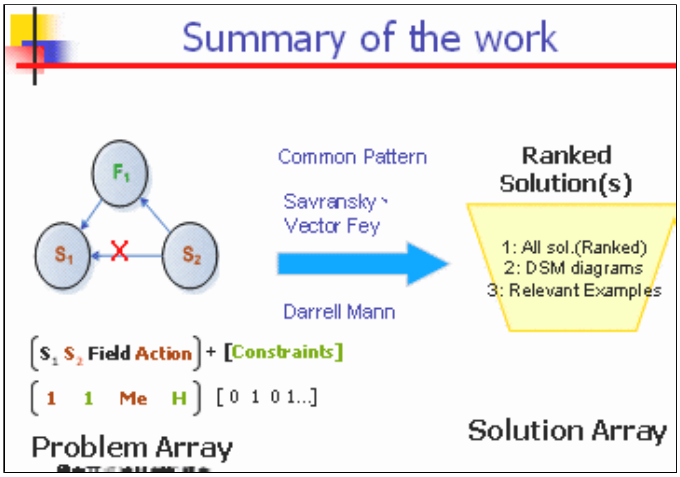


This slide shows how to specify the problem in the Su-Field Model. The Authors define an array of coding digits, which represents each of S1, S2, Field, Interaction type (of the model), and also restrictions for directing the solutions. The restrictions are shown in the right table.

*** This idea of representing a problem in the form of 'Problem Array' seems effective. However, the users need to understand the questions generated by the software.



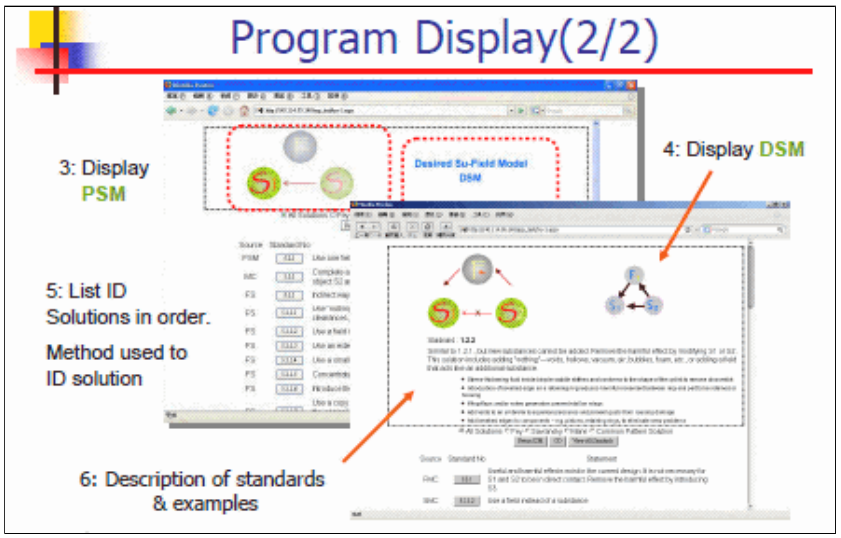
This slide illustrates how the software tool works. User inputs the problem in the form of the Problem Array (with the help of the Su-Field Diagram), then the software tool uses the logics (such as the ones documented in Victor Fey, Semyon Savransky, or Darrell Mann' books) of deriving Inventive Standards. The solution part is also coded in the 'Solution Array'.



The Authors built a software tool by using the ASP.net programming and Access 2003 DB. An example of program display

shown in the slide looks nice.

*** This presentation is a fine work of making a portion of TRIZ logic available as a software tool.



Andrew Shi and Alp Lin (IWINT, P. R. China) [P-A7 #51] presented a Position Paper during the Poster & Demo Session, with the title of "**IWINT, Inc. and Its TRIZ Software Tools**". The Authors accessed to us in mid July for the participation. For arranging their visa applications, we requested them to write a one-page Position Paper for describing how they are working in a TRIZ-related area (even though I knew about IWINT and their TRIZ software). The Position Paper is published in the Abstracts, and the presentation/demonstration was made during the Poster session even though their slides were not published in the Proceedings.

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10. Applications to Non-technical Areas

Business & Management TRIZ Application Sub-Team, Japan TRIZ Society: Ikuo Yoshizawa (The SANNO Institute of Management), Kazumasa Yokoyama (Toshiba Co), Kimihiko Hasegawa (Sano & Associates International Patent Firm), Akira Sato (Funai Zaisan Consultants Co., Ltd.), Shigeru Kuno (NKN Consulting Co., Ltd.), Toshihiko Takeda (Denso Co.), Yasuo Moriya (Fujitsu Advanced Technologies, Ltd.), Takuo Maeda (Takumi System Architects, Ltd.),Teruyuki Kamimura (Willfort International Patent Attorneys), Humiko Kikuchi (Pioneer Co.) [P-A5 #42] gave a Poster presentation on "**An Application of TRIZ Way of Thinking and Its Tools To Develop a New Business Model**". This is a presentation by the second Study Group of Japan TRIZ Society, which has about 15 active members as listed here in the coauthors. Many members come from industries, some from promoters/consultants of TRIZ and other management methodologies. Here I will quote the Authors' Abstract:

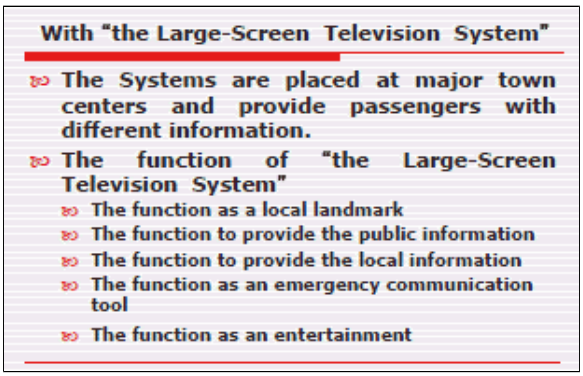
> Most of reported TRIZ applications are for solving technological problems. One of the challenges for TRIZ to be deployed in much wider scale is to prove its capability to help solve business and management problems.
> The B & M Application Sub-Team of the Japan TRIZ Society was organized two years ago to address this challenge. We plan to study methods how to apply TRIZ to tackle business and management problems through analysis of real life cases. We intend to make up a guidance of TRIZ application for the purpose. The present report is about our effort up to the present time and some of its results. The subject we choose is “TRIZ application for developing a new model of business that brings in the best economic performance for a given product."
>
> We divided the process of our study into the following 5 phases;
> 1. Selection of the target. (A product or a field of business)
> 2. Understanding the present situation (Interviews and analysis of available information)
> 3. Drawing a preliminary scheme.
> 4. Developing the business model based on the scheme.
> 5. Presentation of the model and the evaluation. (Presentation to subject matter experts and interviews)
> We choose as our first target “the Large-Screen Television System”. The report shares our analysis of challenges confronting the business and the contradiction they include.

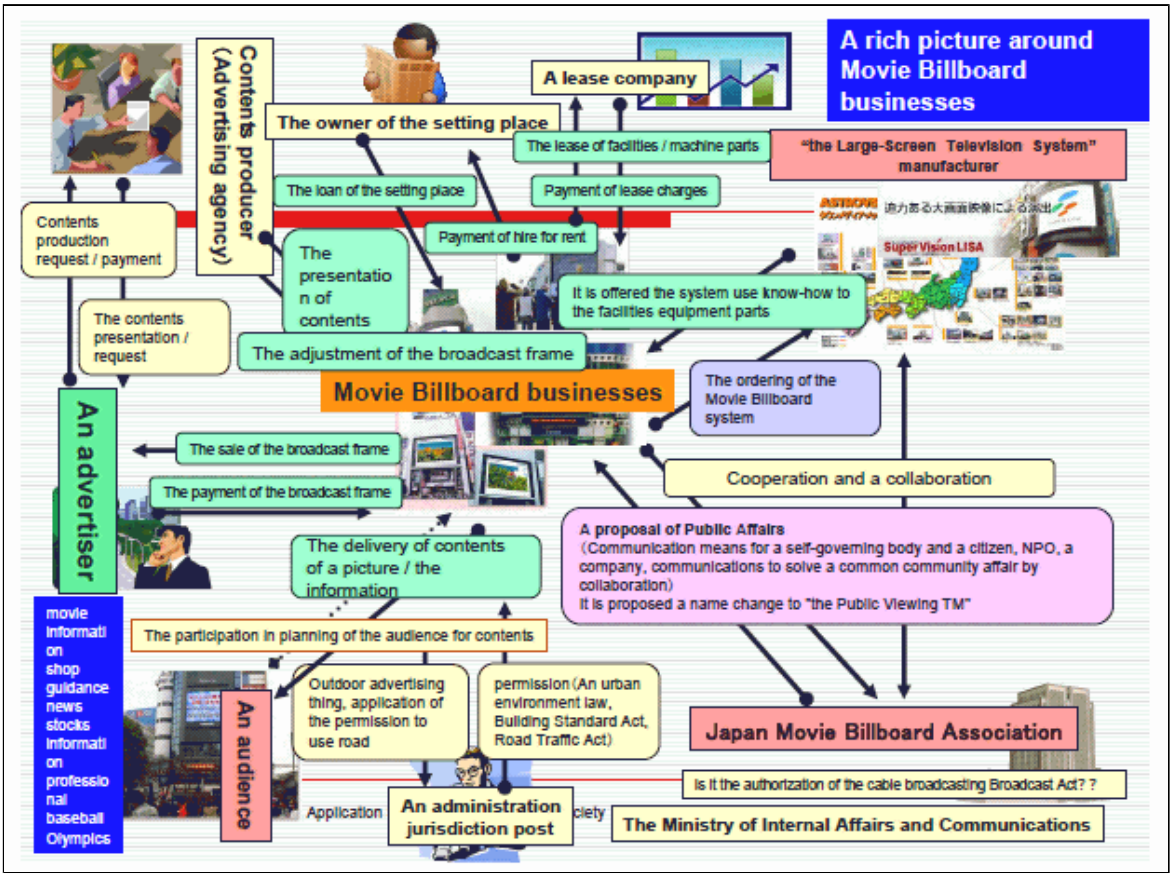
The subject which the Project selected for a case study is "the Large-Screen Television System". The features and functions of the system is briefly summarized in the slide, shown right.

The present situation related to the business of operating the product has been surveyed and drawn in a slide with the title of

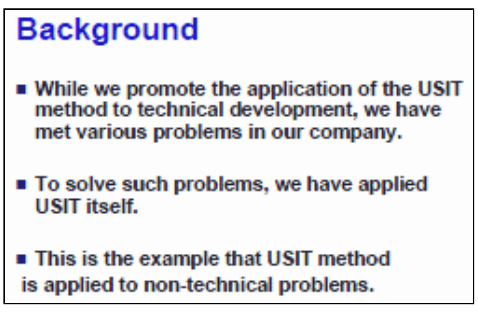
"a rich picture". Relations with different parties involved are drawn here; they include manufacturers, advertisers, contents producers, audience, governments, business associations, etc.

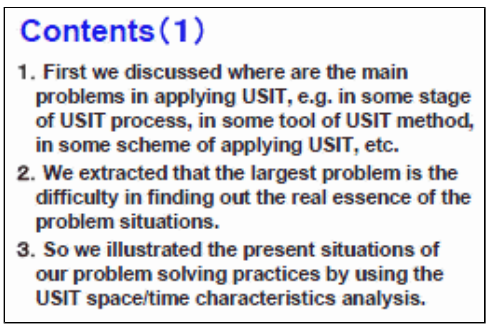
The project has finished the second stage of the 5-stage process mentioned in their Abstract.

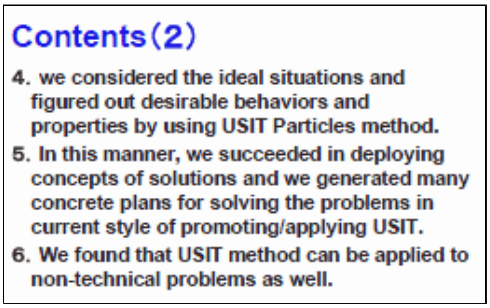




Tateki Oka (Konica Minolta Business Technologies, Inc.) [P-C4 #22] gave a Poster presentation with the title of "**Applying USIT to Improve the Application Practice of USIT to Technical Development**". I will quote the three slides (i.e., all the slides translated into English so far), which are essentially equivalent to their Abstract:

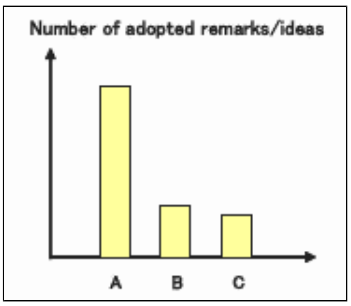




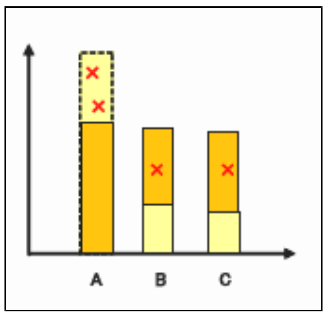


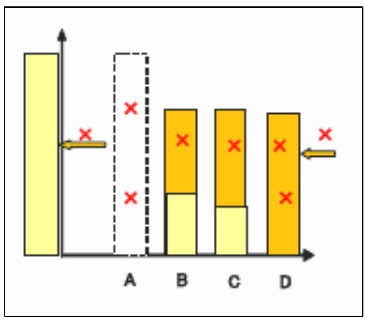
By example, a problem situation is observed that one member A talks much whereas other members B, C, etc. little due to hesitating from expressing different or opposing remarks/ideas. This situation is drawn in a graph, as shown here. In many cases it is desirable to make weaker members B, C, etc. speak out their own opinions and ideas. By using the Particles Method in USIT, desirable situations are expressed in the two graphs shown

below. (The red cross marks represent the Particles, i.e. the magical agents similar to SLP in TRIZ.)



The below-left graph suggests the solution of reducing (e.g., intently suppressing) the talks by the member A and increasing (e.g., encouraging and giving more chances of) the remarks by the members B, C, etc. The below-right graph suggests another solution where the member A is set aside (e.g. by excluding from the group) and a new member D (e.g., having different background, etc.) is introduced to encourage the discussion with the members B, C, etc.





*** The usage of graphs and the Particles method in this presentation is quite instructive.

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11. Miscellaneous

Here I would like to report some more miscellaneous features in the Symposium.

On the First day morning, we had a preliminary session of **Introductory Discussion** for 2 hours with the coordination by KUROSAWA, Shinsuke (The SANNO Institute of Management). This was held, in parallel to the Tutorial presented only in Japanese, with the aims at having a chance of getting acquainted well among the people from overseas and from Japan. The theme was chosen as "Learn about TRIZ from Each Other". About 40 people (i.e., about 12 from overseas and nearly 30 from Japan) attended. After the self-introduction given by all the members, we had enough time of free discussion. Various issues such as TRIZ situations in Japan, experiences in industries and in academia, simplification of TRIZ, integral use of TRIZ with other methodologies, etc. are discussed. This was a fruitful discussion time just before the Symposium.

In the evenings on the First day and on the Second day, we had '**Buffet Dinner & Communications**' for 2 hours each. People met and talked freely without seating, while having food and some soft and alcoholic drinks. This is an effective way of having informal and intimate communications.

In the two evenings, after the 'Buffet Dinner & Communications', people who are mostly staying in the venue had two alternatives. One is to move smaller rooms for further drinking and informal discussions. The other choice was the '**Classical Guitar Concert**' by Catherine Thom. She is an internationally active player, coming from UK with her husband, Dr. Paul Filmore. The Concert was a really relaxing time for us after a lot of presentations and discussions. Having this sort of event was our first experience in Japan TRIZ Symposia, whose agenda were scheduled tightly.

On the Second-day morning, the **General Assembly Meeting of the NPO Japan TRIZ Society** was held for 40 minutes. This was an official meeting as an NPO. Japan TRIZ Society was formed by the voluntary members of 'Japan TRIZ CB' in March 2007 and officially approved as an NPO by Tokyo Metropolitan Government in December 2007. It now has about 140 members. The General Assembly Meeting approved the activity and finance reports for 2007-08 and those plans for 2008-2009, and elected the new Board members. (Note: the fiscal term of the NPO starts on July 1, while the term of the Board members starts on Oct. 1.) Japan TRIZ Society is going to hold the Japan TRIZ Symposium every year and to serve as the center in Japan to promote and penetrate TRIZ.

During the lunch time of the Third day, the **DVD movie of 'Mr. Altshuller's Live Lecture in 1973'** was projected in the main conference room. This event was proposed by Mikio Adachi from DENSO a week before the Symposium. About 60-80 participants watched this; probably for more than 3/4 of them this was the first experience to see Mr. Altshuller moving, talking, and teaching students vividly. The movie gave strong impressions to people. Mr. Altshuller was not in the myth or books but really living! This was the impact.

At the last session of the Third day afternoon, we had a **Feedback Discussion Session** for 40 minutes, in parallel to an Oral presentation in Japanese. Nakagawa coordinated the discussion. About 20 people attended and talked about their impressions during the Symposium as their feedback to the organizers. Most of the feedbacks were positive on the Symposium Unfortunately, the period of 40 minutes was too short for the meeting to discuss any particular issue.

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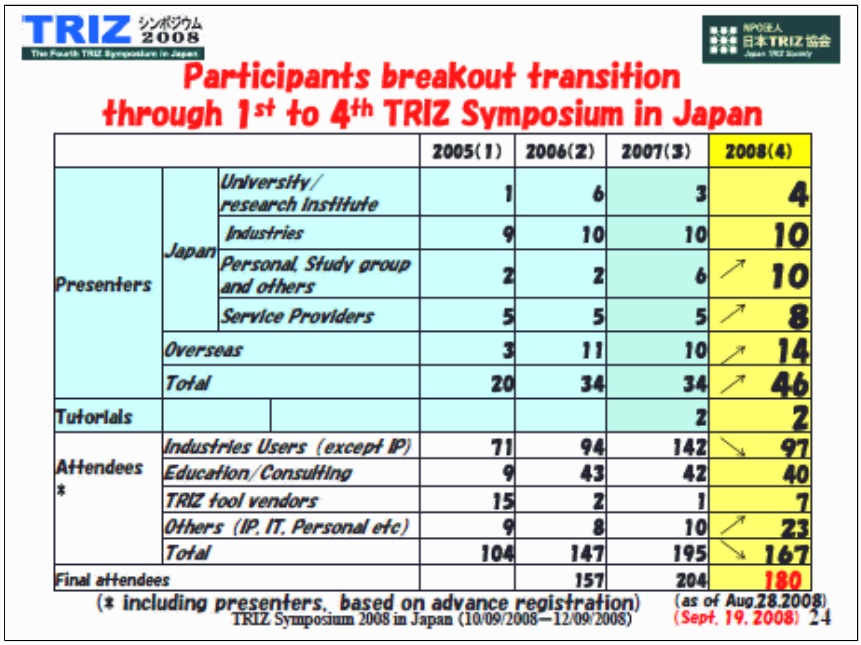
12. Concluding Remarks

As the basis of writing concluding remarks on the 4th TRIZ Symposium in Japan, 2008, I would like to quote the statistics shown in the **Opening Address** by Toshihiro Hayashi, Chairperson of the Board, Japan TRIZ Society.



Participants breakout transition through 1st to 4th TRIZ Symposium in Japan

			2005(1)	2006(2)	2007(3)	2008(4)
Presenters	Japan	University/ research institute	1	6	3	4
		Industries	9	10	10	10
		Personal, Study group and others	2	2	6	↗ 10
		Service Providers	5	5	5	↗ 8
	Overseas		3	11	10	↗ 14
	Total		20	34	34	↗ 46
Tutorials					2	2
Attendees *	Industries Users (except IP)		71	94	142	↘ 97
	Education/Consulting		9	43	42	40
	TRIZ tool vendors		15	2	1	7
	Others (IP, IT, Personal etc)		9	8	10	↗ 23
	Total		104	147	195	↘ 167
Final attendees				157	204	180

(* including presenters, based on advance registration) (as of Aug.28.2008) (Sept. 19. 2008)

(1) The most important factor in the Symposium is the **presentations**. This year we had 3 invited talks, 1 tutorial, and 43 contributed presentations. The number has remarkably increased since last time, and the quality has improved also, I feel. Many presentations have their own basis of studying/applying/training/promoting TRIZ in their organizations.

(2) We also had a large number of **participants**, i.e. 180 in total. Before the Symposium we expected 'over 200' by a simple extrapolation. It was not achieved. We suppose the reasons: (a) 'far from Tokyo' may be a big factor, (b) industries were already sensitive to the world financial crisis and the depression of economy and reduced the number of delegates. Nevertheless, we feel that the TRIZ basis in Japan has been steadily growing for these several years and no sign of flattening/decreasing in the activities and in the quality level of activities.

(3) **Predominant involvement by industries and industrial engineers** has been the most significant feature of Japan TRIZ Symposia, in comparison to TRIZCONs in USA, ETRIA TFCs in Europe, and TRIZ Fest in Russia. The feature is clear this time as well. Besides the presentations by Intel (Israel, Malaysia, and USA) and SEMCO (Korea), a large number of Japanese industries gave oral/poster presentations. They include: Matsushita Electric Industries (its new name: Panasonic Corp.), Hitachi, Tohoku Ricoh, Koganei, Pioneer, Sharp, and Konica-Minolta group. We should also note that many industrial people are involved as coauthors in the presentations by voluntary groups: they include: Toshiba, Denso, Fujitsu, SONY, Fuji Xerox, Yokogawa Electrics, Sumitomo Electric Industries, Sekisui, Kawasaki Heavy Industries, Sekisui House, Bridgestone, and Kokuyo Furniture. TRIZ is now penetrating into these industries steadily, even though not rapidly.

(4) Another remarkable feature in the present Symposium is the increase of presentations by various **TRIZ study groups** which are voluntarily-formed with multiple company members. Such groups may be summarized in the following table. Note that MRI's users group, which ceased its activities by March 2007, is included in this table because of its big influences as the sources of human network on many groups including Japan TRIZ Society itself.

	Organizer	Group name	members	activities	Remarks
a	Mitsubishi Research Institute	Knowledge Creation Study Group	Used to be about 100 engineers from IM user companies	Monthly meetings; annual IM Users Group Meeting (2001-2004)	Started in 1997. Ceased the activities by March 2007.

b	Japan VE Association Kansai Branch	TRIZ Spreading/Use Study Group	about 25 member of industrial engineers	Monthly meetings	Active in Kansai & western Japan area Started in 2003
c		Creativity Study Group	about 20-25 members	Monthly meetings for discussion and practice	Started in 2006
d		Miyagi TRIZ Study Group	2 leaders, several members	Group activities; penetration to local industries	Started in May 2006, Localized in Sendai City, Miyagi Prefecture
e	MPUF	USIT/TRIZ Study Group	about 20 active members; about 150 network registration members	Monthly off-line meetings; 2-3 WG's having off-line meetings	Started in Apr. 2007, Tokyo area
f	Japan TRIZ Society	IP Creation Study Group	about 10-15 members	Meeting every 1-2 months	Started in Apr. 2007
g	Japan TRIZ Society	Business & Management TRIZ Study Group	about 10-15 members	Meeting every 1-2 months	Started in May 2007
h	USIT Training Seminar (IDEA)	Working Group	6 members		Temporary group, started in Mar. 2008

(5) **Extension of TRIZ application field** is taking place gradually. IT & software field is much interested by Japanese industry people; the practices reported by Matsushita Electric Industries are very encouraging and the on-going translation project of Umakant Mishra's book will also be helpful in this field. Application to business and management problems are still in a preparatory stage in Japan.

(6) **Education and research of TRIZ in universities** in Japan are practiced only in limited cases. Extending this should be an important issue in Japan. **Introducing TRIZ into school education** is also a big issue we should explore. The presentation by Taichiro (Son) and Katsuya Miyanishi (Father) is amazing and much encouraging. A father, who is an engineer and relatively new to TRIZ, has guided his junior high school boy in fact finding and inventive thinking. If we can have some school teachers interested in TRIZ or if we TRIZ practitioners can have some chances of teaching TRIZ to children and high school kids, there may be possibilities of starting TRIZ education (or rather education based on TRIZ philosophy) seriously.

(7) **From outside Japan**, we had 14 presentations (2 Keynote Lectures, 11 Contributed papers, and one Position paper) and 15 participants (from 7 countries). These presentations and participation from abroad are very welcome and fruitful for us Japanese TRIZ community; we have learned much and obtained much impact from abroad. Those people from abroad say, at least according to our understanding, that they had also enjoyed our Symposium and obtained various fruits. Our Symposium policy of '**Primarily National AND Partially (but as much as possible) International**' seems to have accepted well by all the participants this year again and to be the basis of our steady growth in TRIZ. We would like to increase the international part gradually.

(8) For conducting our Symposium successfully to be 'Primarily National AND Partially (but as much as possible) International', we had to make extra efforts for **overcoming the language barriers**; such as announcement in English, assisting visa application, translating slides from English to Japanese and from Japanese to English, publishing the Proceedings in two language editions, interpreting the discussions during the sessions, etc. When we received much more presentation submissions this year, these extra efforts seemed overload our capacity of Symposium organizer. On our request, a number of members of Japan TRIZ Society have voluntarily helped us. Thus we have succeeded in carrying out the Symposium successfully this year. This gives us a hope of achieving even higher goal next year!

In short, TRIZ is growing in Japan steadily and healthfully, even though we need to care of it in many new fields.

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13. Next TRIZ Symposium in Japan; Preliminary Announcement

In the Closing Address of the Symposium, the following is announced:

The 5th TRIZ Symposium in Japan, 2009 will be held by Japan TRIZ Society

Date: Sept. 10, 2009 (Thu) to Sept. 12, 2009 (Sat.) (for three days)

Venue: National Women's Education Center, Japan (NWEC)

A conference and training facility with accommodation
Address: 728 Sugaya, Ranzan-machi, Hiki-gun, Saitama, 355-0292, Japan
Location: North-west of Tokyo, about 2 hours from Tokyo Station,
URL (in English): http://www.nwec.jp/en/ Engl.

We look forward to your presentation and participation in this coming active TRIZ event in Japan next year!!

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