

PROMOTION AND APPLICATION OF TRIZ IN HIGH-TECH COMPANIES

Part 1. What We Can Do With TRIZ And Where We Should Use It. For Managers

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1. Introduction
 2. Briefly about TRIZ
 3. Introducing TRIZ into the organization:
TRIZ history at Samsung
 4. Business segments where TRIZ is successfully used
 5. TRIZ utilization with other improvement methods
 6. Barriers and requirements for innovation and for TRIZ
 7. Training and Benefits

Questions And Discussion



1. INTRODUCTION

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- ❑ To share own practical experience of TRIZ application in high-tech industry
 - ❑ To analyze the introduction of TRIZ at Samsung Electronics as one of the most successful companies in implementation of high-tech projects with application of this methodology
 - ❑ To present a way of decreasing the implementation period of TRIZ in a company



2. Briefly About TRIZ

Genrikh S.
Altshuller



1926 - 1998

NAME: TRIZ is Russian acronym for the **T**heory of **I**nventive **P**roblem **S**olving

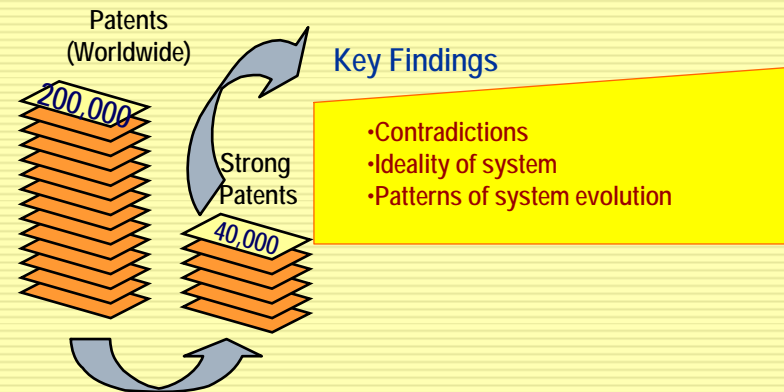
DATE OF BIRTH: 1956, first article

PLACE OF BIRTH: USSR

FOUNDER: Genrikh Altshuller

BRIEF DEFINITION:

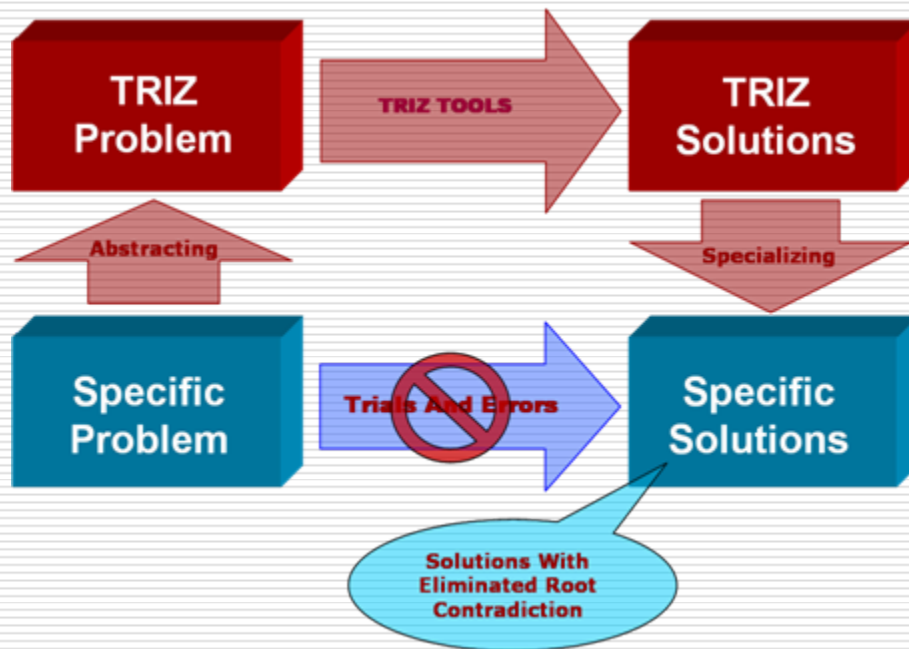
TRIZ was designed for problem solving and provides a logical way of thinking for development of the technical systems through overcoming contradiction and towards the increase of ideality with utilizing resources.



TRIZ IS BASED ON PATTERNS IN THE PATENT DATABASE :

Millions of patents have been analyzed to discover the patterns that predict breakthrough solutions to technical problems.

THE TRIZ SOLVING PROCESS :



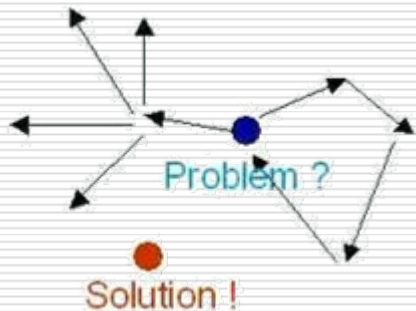
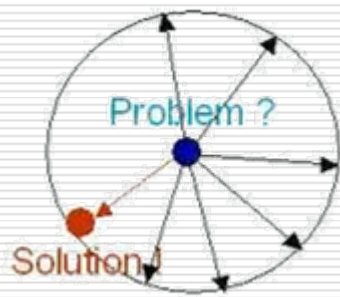
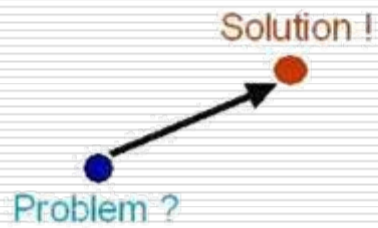
THE PRINCIPAL TRIZ TOOLS ARE :

- ❖ Contradictions
- ❖ Ideality
- ❖ Patterns of System Evolution
- ❖ Inventive Algorithm ARIZ
- ❖ Scientific Effect Database
- ❖ Resource & Functional Analysis
- ❖ 40 Inventive Principle & Matrix
- ❖ S-Fields & Standard Solutions
- ❖ Overcoming Psychological Inertia

THE BASIC CONCEPTIONS :

- ❖ Development of technical systems follows predictable patterns *and so* the speed of technical evolution can be accelerated
- ❖ Problem solving principles are repeatable *and so* any engineer can use them and improve own creativity
- ❖ The creativity can be managed *and so* can be the reason that the project succeeds


TRIZ: What is The Difference?

Methodology	Brainstorming Synectics, etc.	Morphological Analysis Osborn Questionnaire, etc.	TRIZ, ARIZ
Motto	Random Logic: "Let's Try Everything"	Appointed Logic "Let's Try Something"	Methodical Logic: "Let's Formulate Ideal Solution and Solve Contradiction"
Scheme			



- Samsung
- Intel
- Boeing
- BP Amoco
- Chrysler Corporation
- Dana Corporation
- DTM Corporation
- Emerson Electric Company
- Ford Motor Company
- General Motors Corporation
- Goodyear
- Hewlett Packard Company
- Honeywell, Inc.
- Johnson & Johnson
- Lockheed Martin Corporation
- Lucent Technologies
- Massachusetts Institute of Techn.
- Motorola
- NASA
- National Semiconductor Corporation
- Navistar International Corporation
- Nordak Innovatikk AS
- Nortel (Northern Telecom)
- Nupro (Swagelok Company)
- Pratt & Whitney
- Ridge Tool Company
- Rockwell International
- Solarex Corporation
- United States Air Force
- Xerox Corporation
- ...

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- ❑ Development of new concept solutions for existing product design – such as cell phone, camcorder, computers, digital camera
 - ❑ Forecasting and development of future brand-new core technologies (new generation of LCD and semiconductor – improve angle of view of LCD, new LED technology, new cell phone with TV broadcast)
 - ❑ Cost reduction with improved quality
 - ❑ Process/product improvement
 - ❑ Inexpensive engineering without any extra researches for problem solving
 - ❑ Cost reducing by avoiding competitor patents and development of new patents (“umbrella patenting”)

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- Statistical analysis and problems
 - Numerical and calculating (math) problems
 - Trivial design changes without contradictions
 - Problems required trade-off solutions
 - Optimization problems with selection of known materials, dimensions, bonding



3. INTRODUCING TRIZ INTO THE ORGANIZATION

SAMSUNG ELECTRONICS COMPANY

Vice-Chairman & CEO, Jong-Yong Yun

Digital Media Business

Telecommunication Network

Digital Appliance Business

Semiconductor Business

LCD Business

Corporate Executive Staff

Corporate Technology Operations

R&D Innovation Center

Value Innovation Program Center

TRIZ Team,



TRIZ Team, 2003

Introducing depends on specific company's conditions. Here is just short history of TRIZ in SEC:

1998

- ❑ First induction to TRIZ in Samsung Group
- ❑ Installing first TechOptimizer software (1 copy)
- ❑ Formation of first TRIZ research meeting for several Samsung companies (Samsung Electronics, Samsung SDI, Samsung SAIT, Samsung Electro-Mechanics)

2001

- ❑ Establishment of TRIZ promoting department
- ❑ Inviting 2 Russian TRIZ experts (August)
- ❑ Installing Techoptimizer software (10 copies)
- ❑ **First 2 successful projects in semiconductor and printing (TRIZ contribution more \$10 million and 12 patents)**
- ❑ Establishment of monthly TRIZ research meeting
- ❑ Induction of TRIZ Innovation Master education and certification Program
- ❑ TRIZ training and certification of 8 SEC's engineers

2002

- ❑ Development of TRIZ activities in all 6 units of SEC
- ❑ **Excellent results through conducting strategic projects (23 R&D projects, cost reduction \$24 million, 24 patents for year)**
- ❑ Inviting 2 more TRIZ Specialists (the total 4 persons)
- ❑ Training 22 new Innovation Masters
- ❑ TRIZ was introduced to each SixSigma Black Belt Courses (2 hours)
- ❑ Opening the first annual TRIZ Festival (October) at SEC

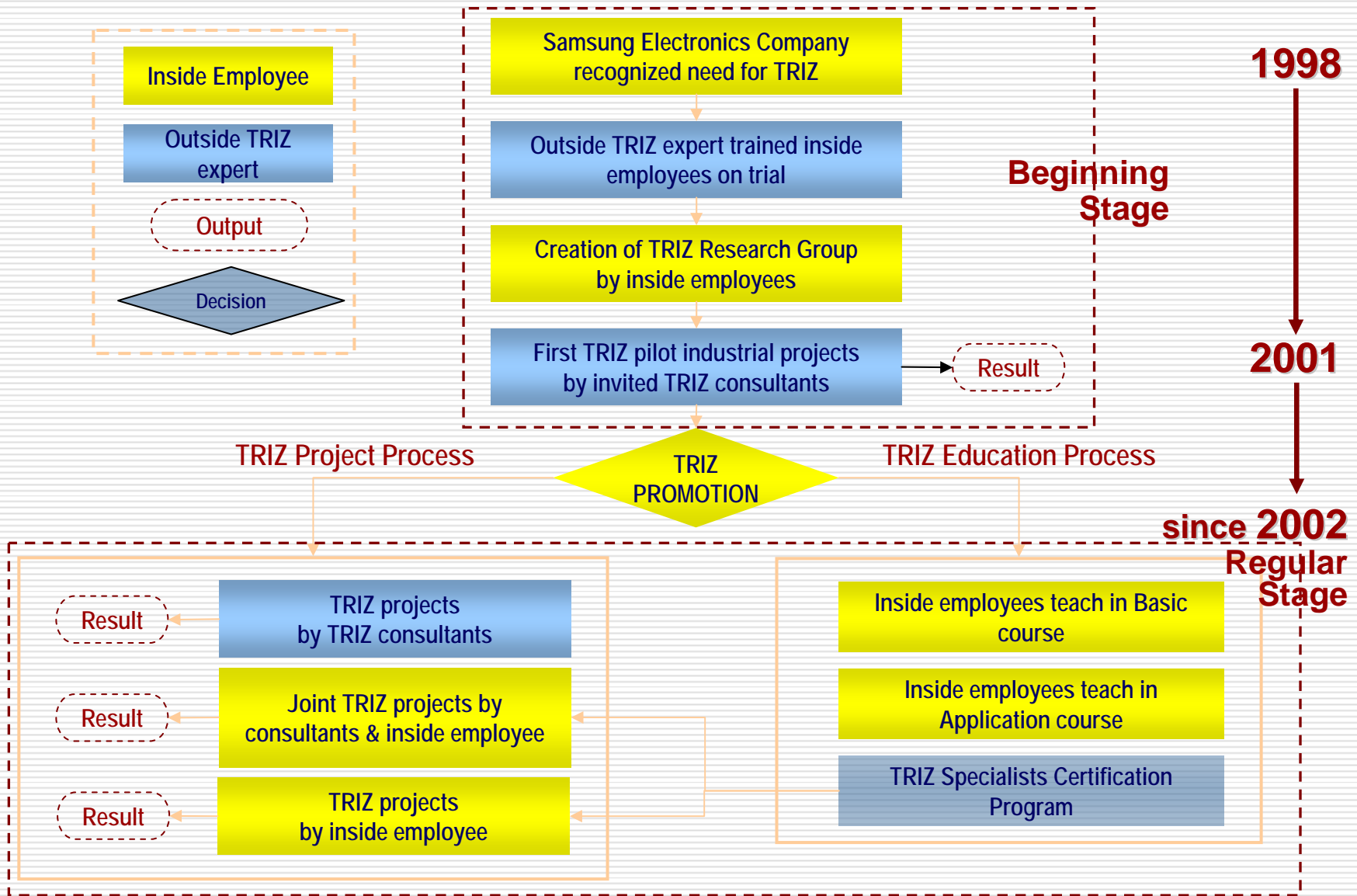
2003

- ❑ Accomplishment of TRIZ educational program for Samsung employees
- ❑ Establishment of Samsung TRIZ Association
- ❑ Building TRIZ portal site and Intranet (network)
- ❑ **Financial contribution by TRIZ is \$150 million (about 50 projects, 52 patents for year for all Samsung Groups: SEC, SDI, SAIT, SEMC)**
- ❑ Training 20 new Innovation Masters

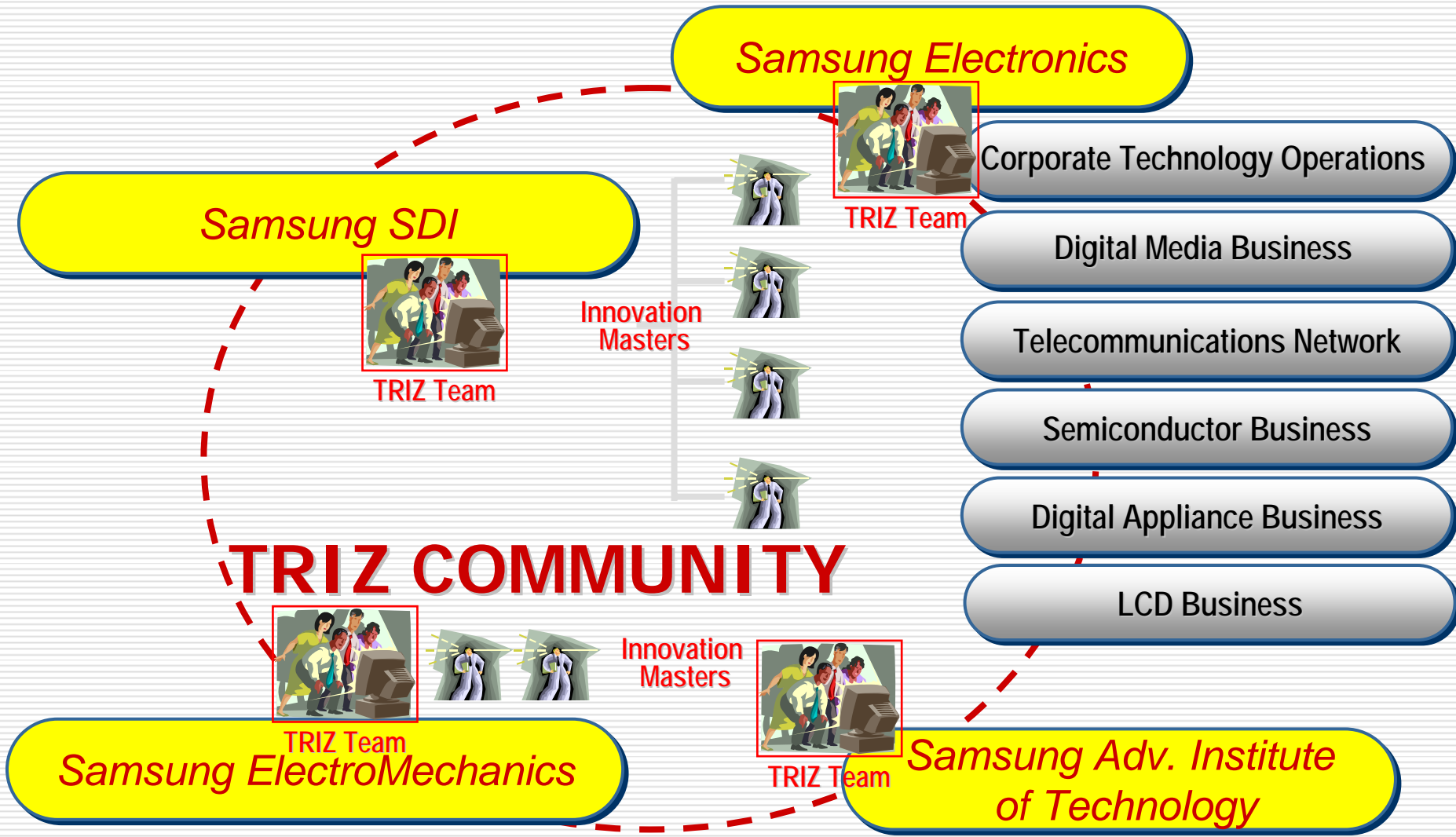
2004

- ❑ **Financial contribution by TRIZ is \$65 million (about 30 projects, 64 patents just for SEC, no data for other Samsung groups for this year)**
- ❑ Training 24 new Innovation Masters

Strategy of TRIZ Promotion

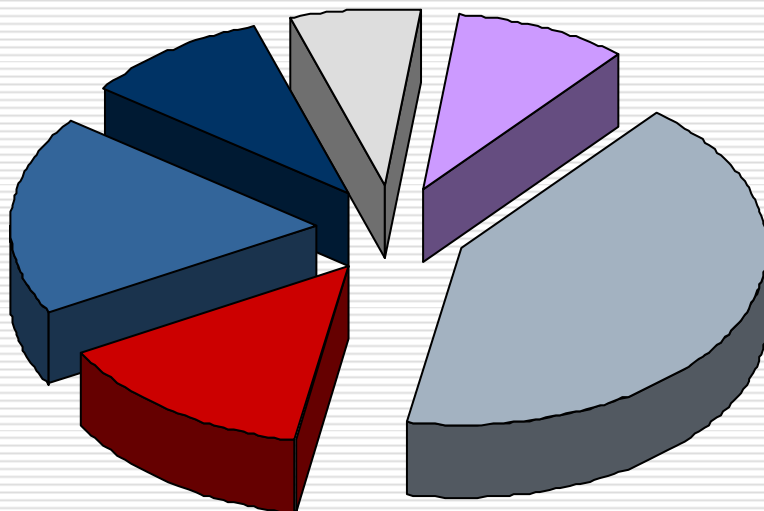


TRIZ Community In Samsung Group





4. Business Segments Where TRIZ Is Successfully Used



- Existing Product Improvement
- New Product Development
- Manufacturing Technology Improvement
- Overcoming Patents; Patent Development
- Short And Long-Term Forecasting
- Scientific-And-Research Engineering

□ Stages of life cycle where TRIZ is applied:

- Research (SAIT – Samsung Advanced Institute of Technology)
- Product design
- Technology development
- Manufacturing.

SEC applies TRIZ successfully in each of these areas.

Typically TRIZ is utilized in the first stages of product/process development

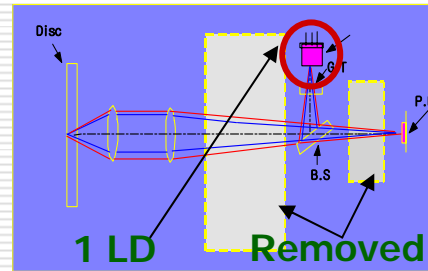
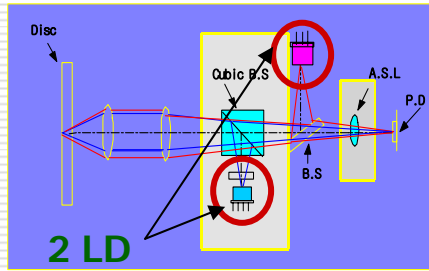
□ The main objectives of TRIZ application are:

- Cost reduction – with improved quality
- Process/product improvement
- Engineering problem solving
- Avoiding competitor patents and development new patents (“umbrella patenting”) – Samsung is one of the leaders in total patents
- Forecasting and development of new concepts for existing product design – such as cell phone, camcorders, computers, digital camera
- Development future brand new core technologies (new generation of LCD and semiconductor – improve angle of view of LCD, New LED technology)

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- Semiconductor business
 - LCD
 - Mobile phone business
 - Particular example is for development software for telecasting over the mobile phone
 - Telecommunication network business
 - Digital media business (SDI)
 - Home appliance business
 - R&D institute of technology (SAIT) – supports all groups

TRIZ Products: Technical, Financial, Market Results

DIGITAL MEDIA BUSINESS: DVD Pickup Simplification



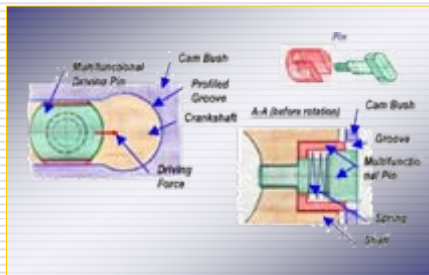
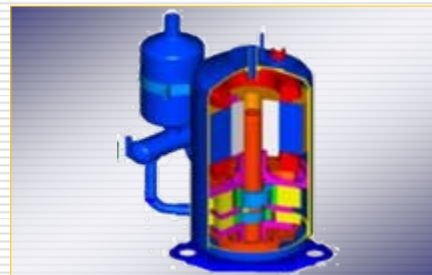
- Cost Reduction
- Standard Time Reduction
- Total Savings: \$23mil./yr
- Implementation Time 8months

SEMICONDUCTOR BUSINESS: Particle Reduction



- Productivity Improvement
- Maintenance Reduction
- Total Savings: \$6.6mil./yr
- Implementation Time 6months

HOME APPLIANCE BUSINESS: Compressor Improvement



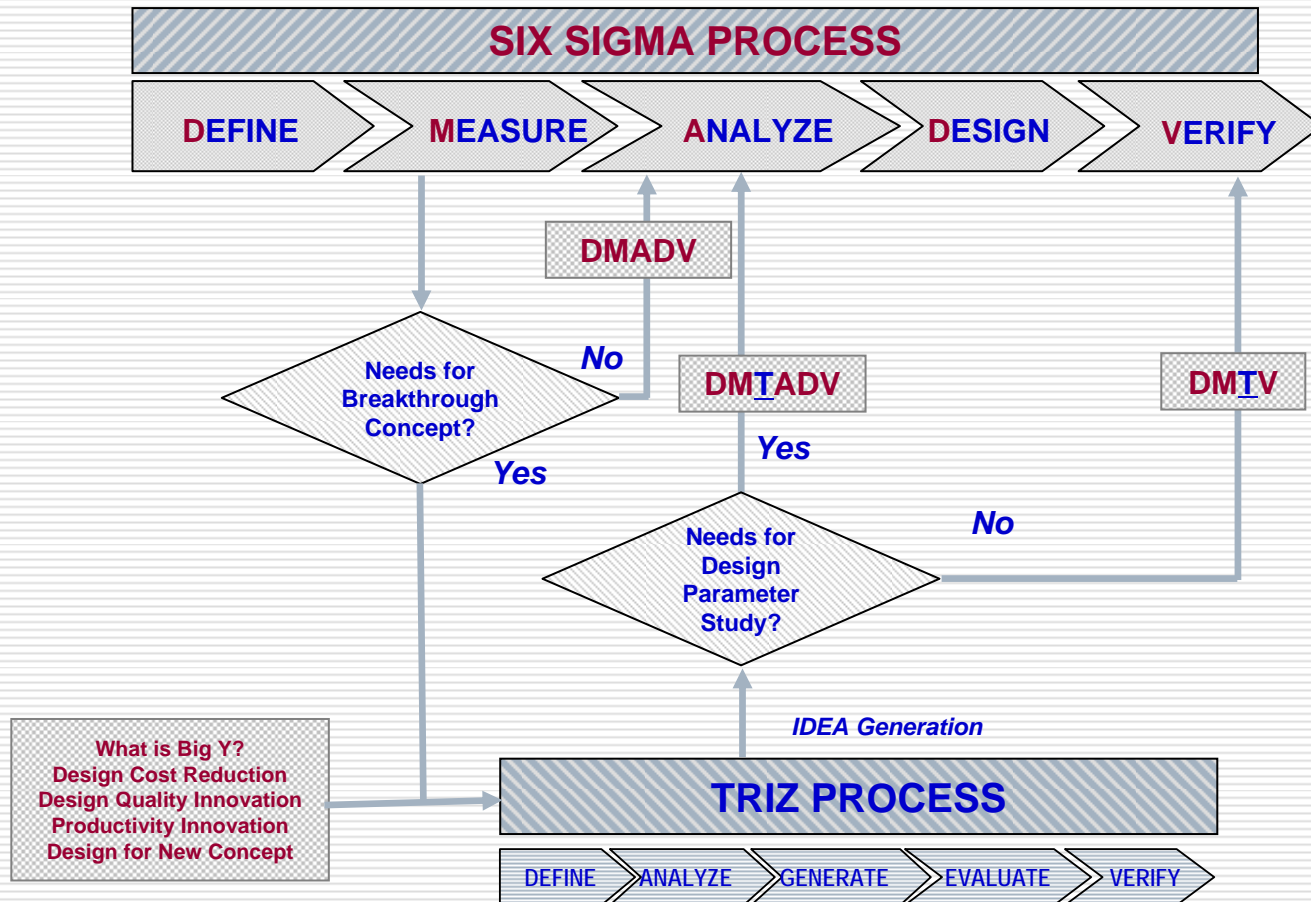
- Reliability Improvement
- Umbrella Patenting
- Total Savings: \$10mil./yr
- Implementation Time 4months



5. TRIZ Utilization With Other Improvement Methods

TRIZ Use in Conjunction With Other Methods

1. Six Sigma is popular and it is the main official improvement tool at Samsung. Top management is fully supporting Six Sigma and almost all Samsung engineers are taking the different Six Sigma courses.
2. Some time ago (about three years) Six Sigma people began to understand that TRIZ can make up for the weak points of Six Sigma process. While Six Sigma goes for finding the best trade-off solutions, TRIZ goes for overcoming contradiction.
3. Six Sigma helped to find out the factor of problem but Six Sigma couldn't answer "How To Solve" in many problems.
4. Samsung people tell that Six Sigma is statistical thinking and TRIZ is inventive thinking.
5. SEC people recognized the need of TRIZ to complement Six Sigma. Next slide shows connection between TRIZ process and Six Sigma Process in Samsung Electronics.
6. DFSS – Design For Six Sigma is a very good segment for TRIZ application



DMTADV, DMTV T-TRIZ added



6. Barriers And Requirements For Innovation And For TRIZ

What were the biggest barriers to deploying TRIZ? How were they overcome?

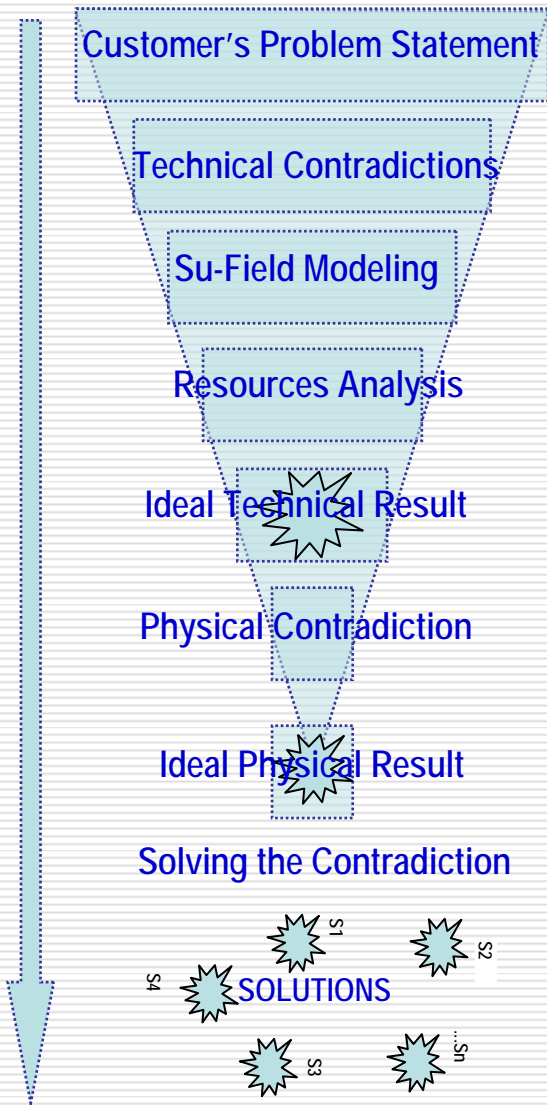
□ Unfamiliarity and so distrust to TRIZ

- TRIZ does not have rich parents, big corporate sponsors and cool advertising compared with Six Sigma, for instance

□ Best to overcome these obstacles by getting excellent results in the projects after TRIZ application

- At Samsung Triz gave good results after half of year of its industrial project-oriented application in 2001 together with experienced specialists.

TRIZ Methodology Education and Promotion in different divisions



- It is extremely important to develop and to use the same (TRIZ) "language" and approach for clear communication, discussion and solving the real problems between different specialists from different divisions
- TRIZ "language" uses specific terminology: mini-problem, subfield, technical contradiction, physical contradiction, ideal final solution, resource analysis, tool, product, etc.).
- With TRIZ education and triz language people understand each other and move in the same direction during solving process more easily.

Key requirements to embed TRIZ in the company

□ Management:

- **The most important thing is management support.** TRIZ at Samsung has been introduced by CEOs of highest level, and Samsung vice chairman Jong-Yong Yun is just one of them. He is personally eager to discuss all details and problems (and particularly, it was in the beginning stage of TRIZ introduction in the company) for support and extension of triz activities. By the way he is really Big Boss of this company ☺ Therefore, TRIZ at SEC was accepted kindly, quickly and with big enthusiasm.
- Of course, we can guess that there is some difference between SEC and Intel approach. Nevertheless, **management support is important thing.**

□ Experienced people:

- **Right people** are another key thing. TRIZ activities and promotion is realized easier and faster in large company when people with innovation experience do these activities
- People who had already about 5-10 own patents before their TRIZ experience. As a rule, after studying TRIZ, they understand that innovation activity and making patents become easier with TRIZ utilization in comparison with other methods. These people can deeply understand advantages and specificity of triz and can start to teach other people quickly.

□ Well thought-out innovation structure and community network:

- There is one more key point for large company. SEC has six big divisions: semiconductor, lcd, home appliance, telecommunication network, digital media and corporate technology operations. Each of these divisions has own triz team with at least 3 persons. They also have other triz people outside the triz team. TRIZ headquarter has 8 triz specialists and located at Corporate Technology Operations Division. These 8 people are advanced triz specialists and this group includes Russian triz experienced specialists. They intensively help other triz groups in training, consulting, solving the current projects, in support computer triz intranet; organize monthly triz research meeting and discussions. They also promote triz in management level of the company and implement short 1-2 hour presentations on triz education for company management of different levels.

□ Individual motivation:

- Personal motivation through salary and benefits is other point. Each Samsung certified triz specialist has own motivation, because company pays each of them additional monthly bonus. These specialists have other different and non-money benefits: career promotion, additional holiday, and etc.

□ Public recognition through special events:

- Every year in October SEC arranges annual TRIZ Festival. During this festival the new Innovation Masters which are finished full educational course (120 hrs) presents their triz projects and show their real machines and equipment on the exhibition. Big Jury with CEOs from different SEC division and SEC vice chairman Jong-Yong Yun, as head, select 3-4 best projects. These projects are awarded with premium.



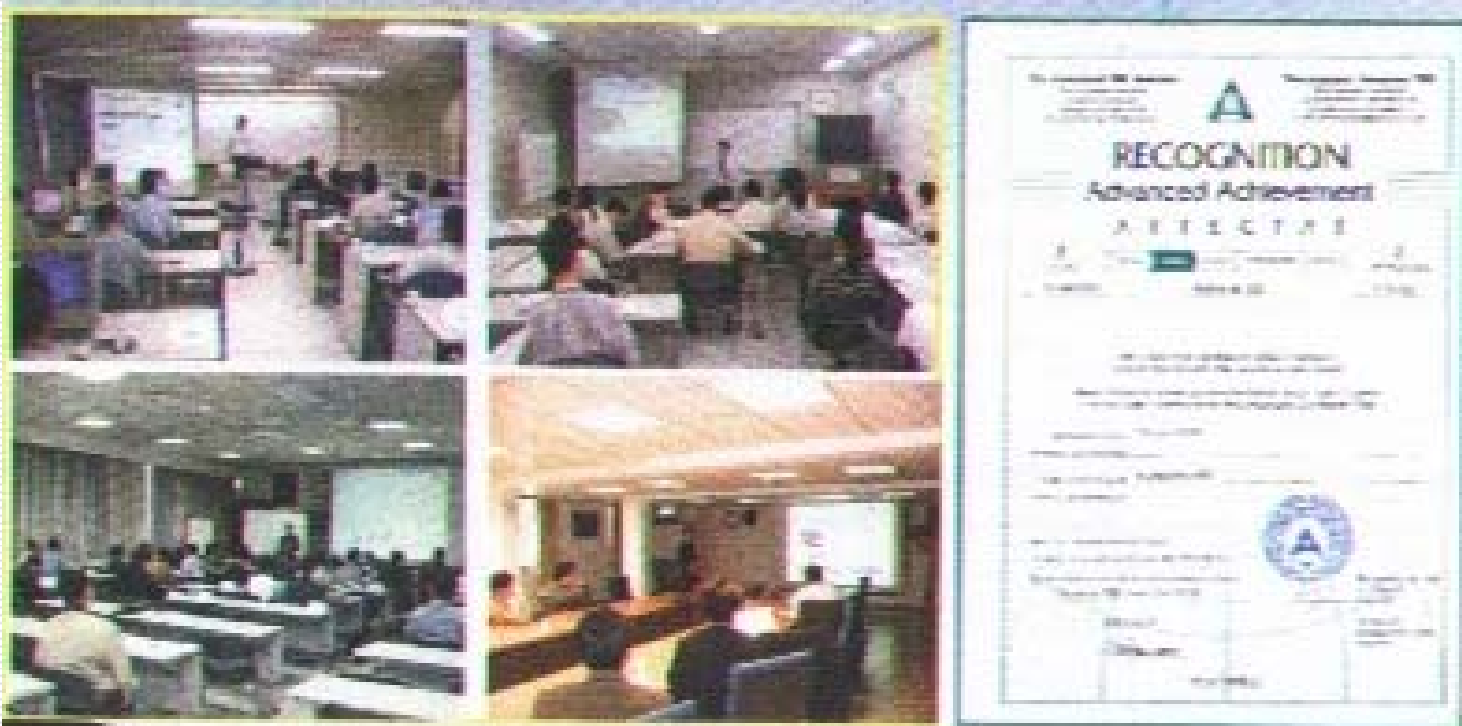
7. TRAINING, PRACTICAL SKILLS AND INCENTIVES

Module	Course Level	Certification Equivalent	Available Skills	Time	Students
1	Introductory	Apprentice	Formulation of contradictions, ideal final result, looking-for resources, solving problems with application of Principles and Matrix	40 hrs	60-75
2	Basic	Practitioner	Application of ARIZ-85B and fragments for real practical situations, solving problems with ARIZ	80 hrs	15-20
3	Advanced	Specialist	System analysis, problem selection, implementation of the obtained solution, patenting process, TRIZ application with other methodologies, soft TRIZ, two hands-on projects	130 hrs	5-7

- ❑ Basic and application courses are conducted by several TRIZ trainers for all students. After each module, students must pass a test. Then the best students are encouraged to move to the next level of training.
- ❑ The last module for "TRIZ Specialist" is provided by personal training: trainer works individually with each student. The trainer coaches the student to solve his real industrial projects during period of about 4 months.
- ❑ Typically whole training process takes 8 months.

Samsung Electronics TRIZ Education Courses include:

- ❑ **Basic Course:** Training person obtains basic knowledge on TRIZ
- ❑ **Application Course:** Training person conducts industrial projects as a driven member with TRIZ consultant as a driver
- ❑ **TRIZ Specialist Certification Course:** Training person conducts 1or 2 industrial projects as a leader with TRIZ consultant as an assistant





Samsung Electronics conducts TRIZ research meetings every month.

□ Purposes:

- Sharing newest TRIZ information
- Continuous education through discussions
- Investigation of the industrial TRIZ projects with good results, failures, and mistakes

□ Participants:

- invited TRIZ specialists of all Samsung Group (more 50 persons)
- TRIZ consultants
- TRIZ foreign specialists

□ Main Activities:

- Regular discussing significant industrial projects
- Presenting news from World TRIZ Symposiums
- Exploring the new research results on TRIZ methodology and its application



Samsung Electronics conducts annual TRIZ Festivals (since 2002).

Goals:

- ❑ Presentation and exhibition of excellent TRIZ projects
- ❑ Conferment of certificate TRIZ Specialists (about 20 persons annually)
- ❑ Award for the best TRIZ projects (3-4 projects annually)

Participants:

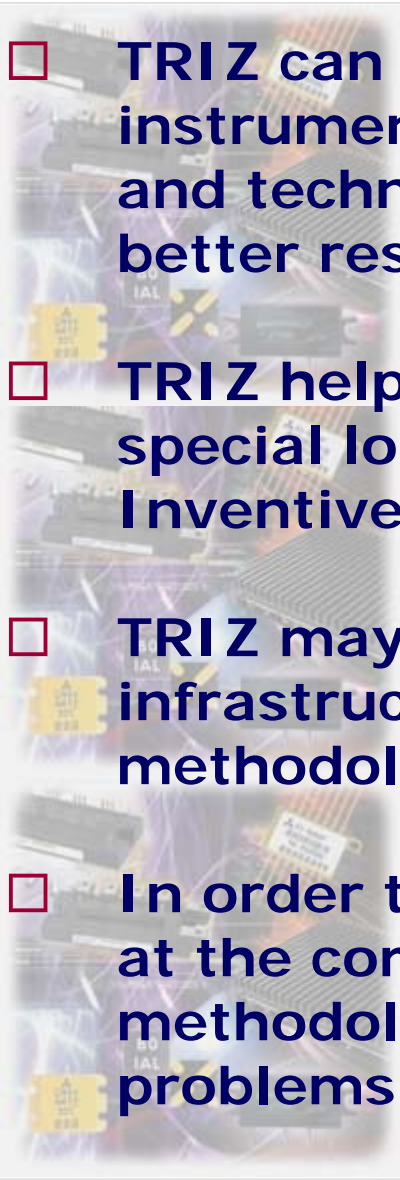
- ❑ High-level management of Samsung Electronics, including Chairman as a jury
- ❑ Graduating TRIZ Specialists after certification course
- ❑ TRIZ consultants, foreign TRIZ specialists



- ❑ Graduation of the first Innovation Masters certified by IMCorp., 2001
- ❑ Developing educational TRIZ programs and materials in SEC, 2001-2003
- ❑ Conducting the first annual TRIZ Festival, October-2002
- ❑ Establishment of Samsung TRIZ Association, 2003
- ❑ Authorization from International TRIZ Association – MATRIZ, 2003
- ❑ Graduation of the first TRIZ Specialists certified by SEC & MATRIZ, 2003

Training structure and methods, expertise levels

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- **What level of people get TRIZ training: is there a preferred profile (education and experience), are there pre-requisites ?**
 - For basic and application courses there is no strong recommendations related to student's education or experience. But for the final course the best way is to select people with innovation background who have 5-10 of their own patents.
 - **How are people with TRIZ expertise and results rewarded ?**
 - Each Samsung certified triz specialist has his own motivation, because the company pays each of them an additional monthly bonus. These specialists have other individual motivations: self-esteem, career promotion, good evaluations, additional holiday, etc.
 - **How are TRIZ projects conducted and what are the key "human factors" associated with work of engineer and TRIZ expert ?**
 - Triz expert and customer work together during all project stages. Usually, triz project is implemented during 3-4 months. There are some "special human rules" ☺ for this collaboration – the customer should have "parental feelings" to all ideas developed together with triz expert and will be willing to explore concepts developed.

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- TRIZ can be used as a powerful intellectual instrument to solve simple and difficult technical and technological problems more quickly and with better results**
 - TRIZ helps to solve problem with application special logical tools: Ideality, Contradictions, Inventive Principles, Standards, ARIZ**
 - TRIZ may be introduced into the company infrastructure through other improvement methodologies, for instance Six Sigma**
 - In order to decrease implementation period of TRIZ at the company it is recommended to learn methodology through conducting industrial problems together with experienced expert**



Questions And Answers