



# The Major Research Areas Related To TRIZ In The NER-Center

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Innovation Method And Tool



国家技术创新方法  
与实施工具工程技术研究中心  
National Engineering Research Center for  
Technological Innovation Method and Tool



河北工业大学  
HEBEI UNIVERSITY OF TECHNOLOGY

## 1. Introduction of the center

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## 2. Structure of C-TRIZ

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## 3. Major research topics

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## 4. Dissemination of C-TRIZ

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## 5. Plan for the development of an international

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### TRIZ research center

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## 6. Conclusion

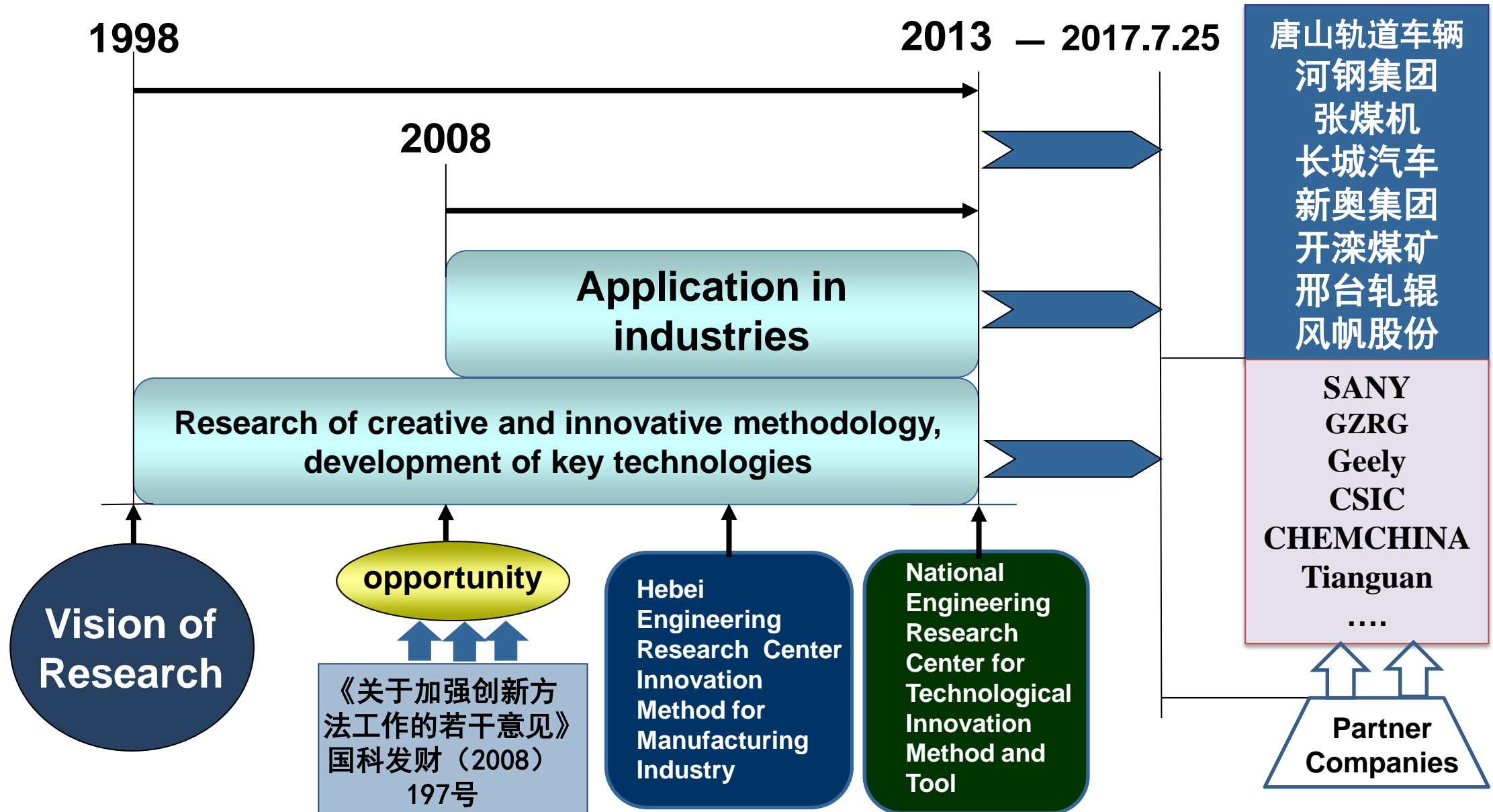
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# 1、Introduction of the center





# The development path of the center



# The Research Team In the Center





# Co-operative Bases: Region, City or Company



浙江省科技厅基地



青海省科技厅基地



河北省科技厅基地



内蒙科技厅基地



天津市北辰区基地



天津市西青区基地



天津市高新区管委会基地



河北承德市基地

广州无线电集团基地



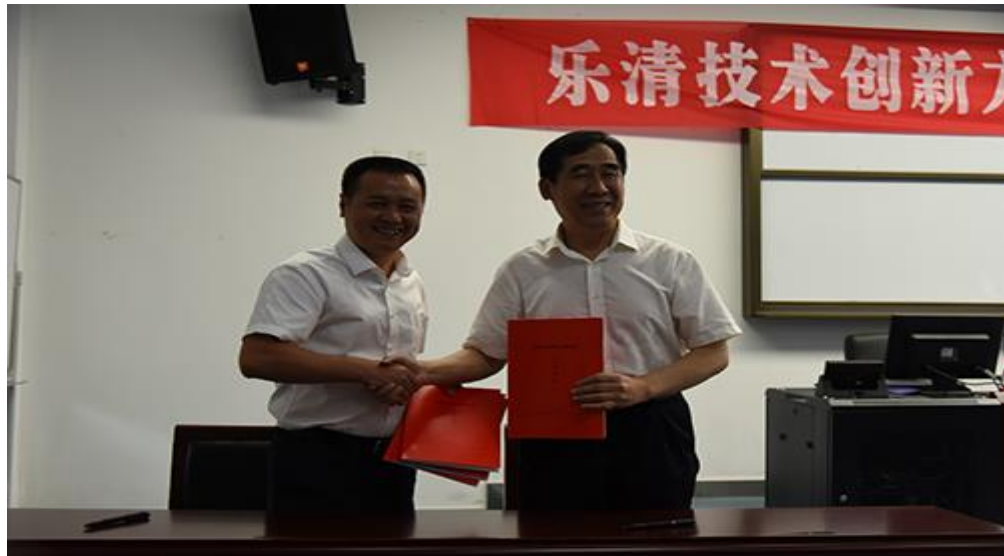
上海东方久乐基地



中车唐山轨道车辆基地



# The Yueqing Institute (Wen Zhou, Zhejiang Province) (2018.1-4)





# Popularization and Training Activities





# Training Teachers For Regions & Universities



2015年4月11日~4月17日举办 “区域基地创新培训师



2016年举办 “创新方法交流师资研讨班”



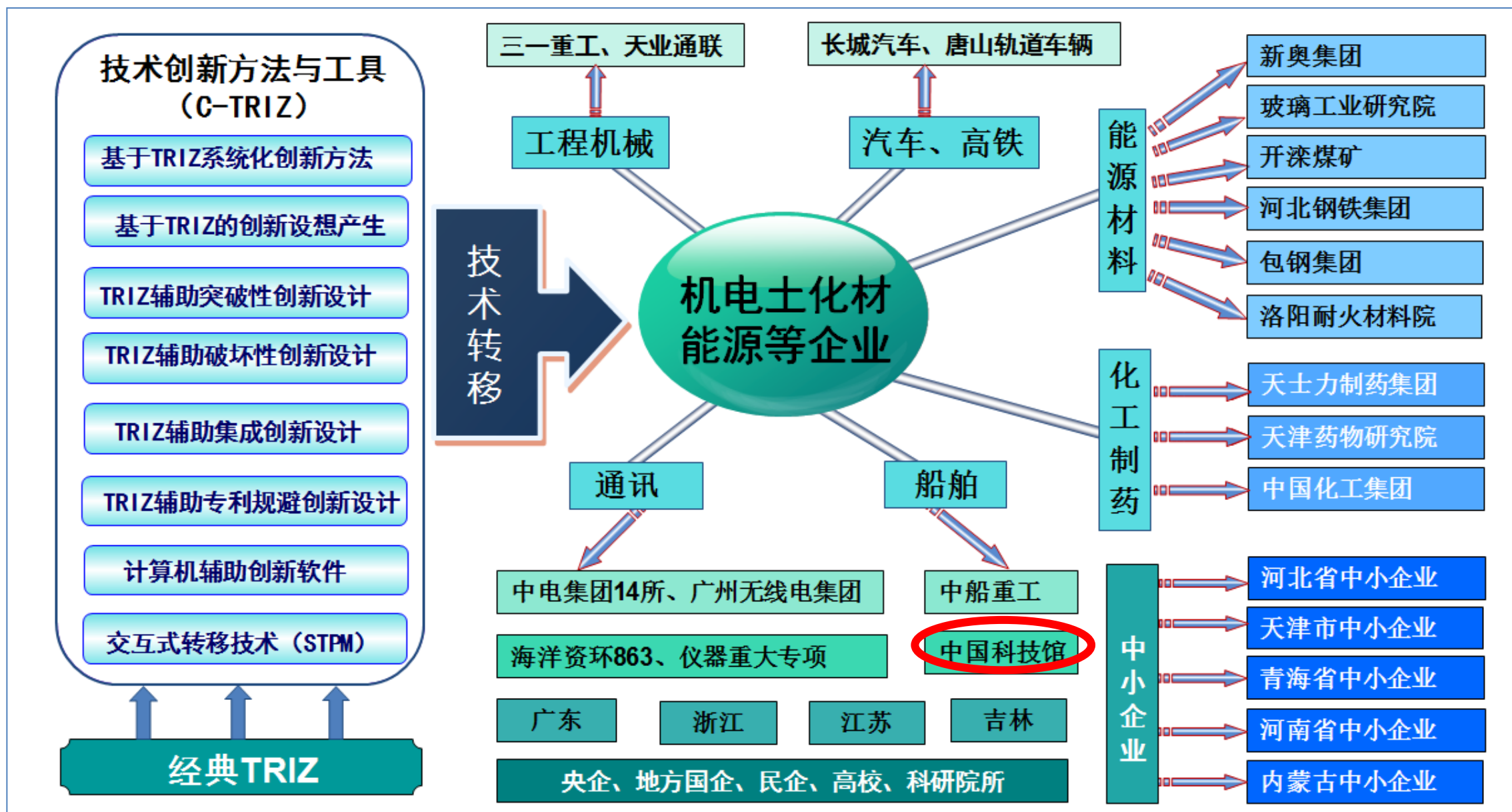


# Training Innovative Engineers For Industries





# The Areas of the co-operation



CHEMCHINA

CSIC 中船重工

TASLY HOLDING GROUP  
天士力控股集团

中车唐山机车车辆有限公司  
CRRC TANGSHAN CO., LTD.



中国航天

ENN 新奥  
用我所能 善待明天

SANY 三一集团

长城汽车  
专注 专业 专家

吉利汽车  
GEELY AUTO

包钢集团  
BAOGANG GROUP

HBIS  
河北钢铁集团

鄂尔多斯  
ERDOS

石家庄中煤装备制造股份有限公司  
SHIJIAZHUANG ZHONGMEI COAL MINE EQUIPMENT MANUFACTURE CO., LTD.

渤海钢铁集团  
BOHAI STEEL GROUP

More than 1220 companies  
in China have been  
corporate with the center  
to disseminate TRIZ in the  
past 10 years.

广州无线电集团  
GUANGZHOU RADIO GROUP

广东生益科技股份有限公司  
SHENGYI TECHNOLOGY CO., LTD.

天冠集团  
TIANGUAN GROUP

KINGFA  
金发科技股份有限公司  
KINGFA SCI. & TECH. CO., LTD.

万和  
燃气具专家

FIYTA

TOLIAN  
天业通联

EZ3  
张垣

JIESAI 杰赛科技

GEESUN  
吉阳

开滦集团  
KAILUAN GROUP



## 2. Structure of C-TRIZ

**CRIMSON PUBLISHERS**  
Wings to the Research

Research & Development in  
Material Science

ISSN: 2576-8840

Mini Review

**C-TRIZ: The Further Development of TRIZ  
in China**

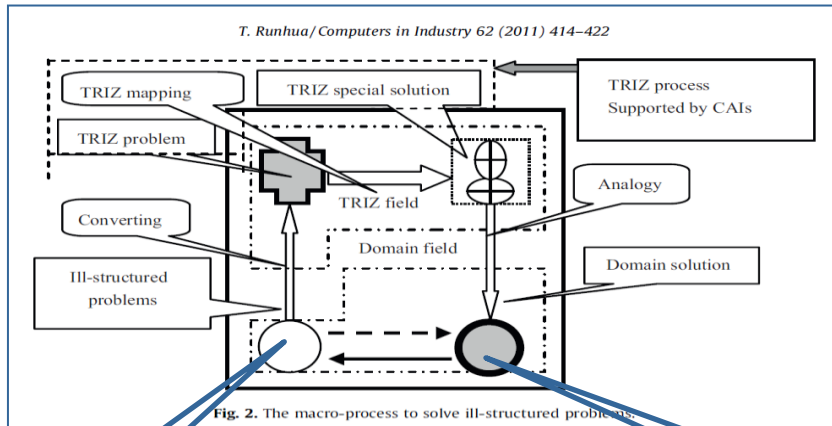
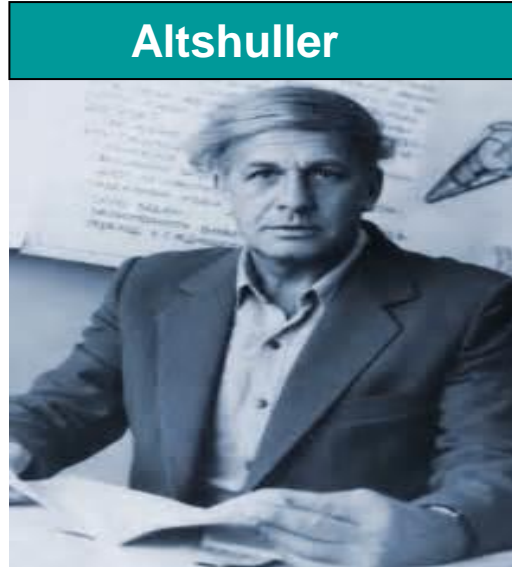


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**Submission:** 📅 July 23, 2018; **Published:** 📅 August 08, 2018

TRIZ is only innovation knowledge-base and evolutionary-directed techniques that can provide the user with the accumulated power of the world's best inventors an innovations.



- ❑ A inventive problem-solving methodology tailored for scientific and engineering problems
- ❑ It is more structured and based on logic and data, not intuition or brainstorming.
- ❑ Hypothesis: There are universal principles of creativity that are the basis for creative innovations that advance technology
  - *Somebody someplace has already solved this problem (or one very similar to it.) Creativity is now finding that solution and adapting it to this particular problem*
  - *Engineering ingenuity based on an inventory of ideas or a checklist*

Domain  
problem



Domain  
solution



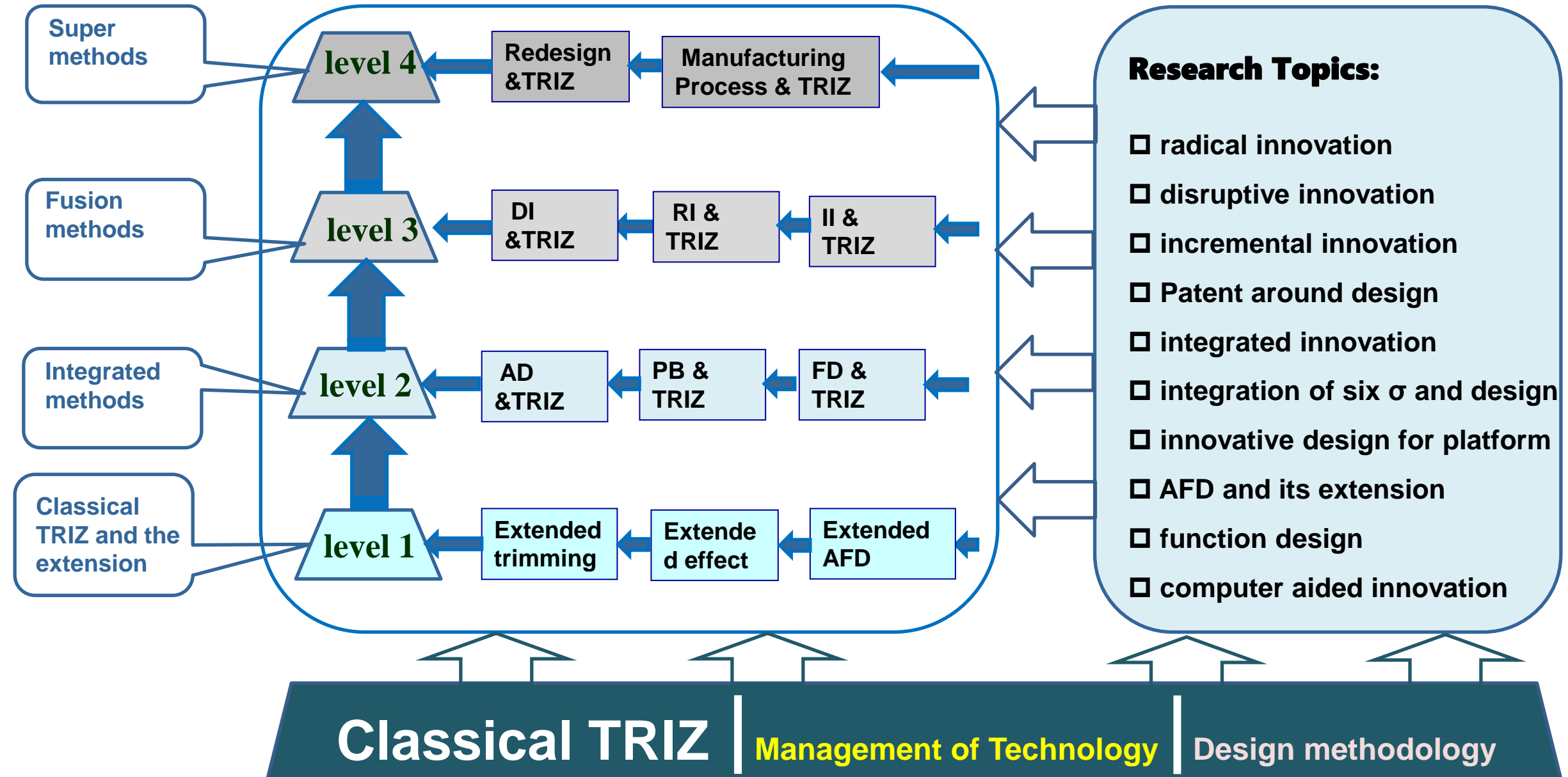


Day 3 - 28.10.2015

TRIZ Future Conference 2015 - Agenda 15092015.xlsx

16.15		Problem solving methods of Standard Solutions under the analogy thinking. WANG, Qiuyue; YANG, Bojun; DUAN, Xiuling	User in engineering innovative design and contradiction identification*. HOUSSIN, Remy; SUN, Xiaoguang; RENAUD, Jean; GARDONI, Mickael	
16.40	Coffee Break			
17.00	Workshops	The Workshop topics will be selected by the participants and announced at the conference		
	Workshop topics	<div> <div> 1. Corporate TRIZ: How to implement TRIZ into the innovation process  2. TRIZ for Services: How TRIZ supports service design  3. TRIZ education: Cooperation of industry and universities  4. Extending TRIZ: Combination with other systematic methodologies for product development  5. TRIZ future: Middle and long term perspectives  6. TRIZ markets: Building business models and discovering “Blue Oceans” </div> <div>   </div> </div>		
18.00	End of the conference day			

# C-TRIZ: Four levels of methods and 10 research topics in the center



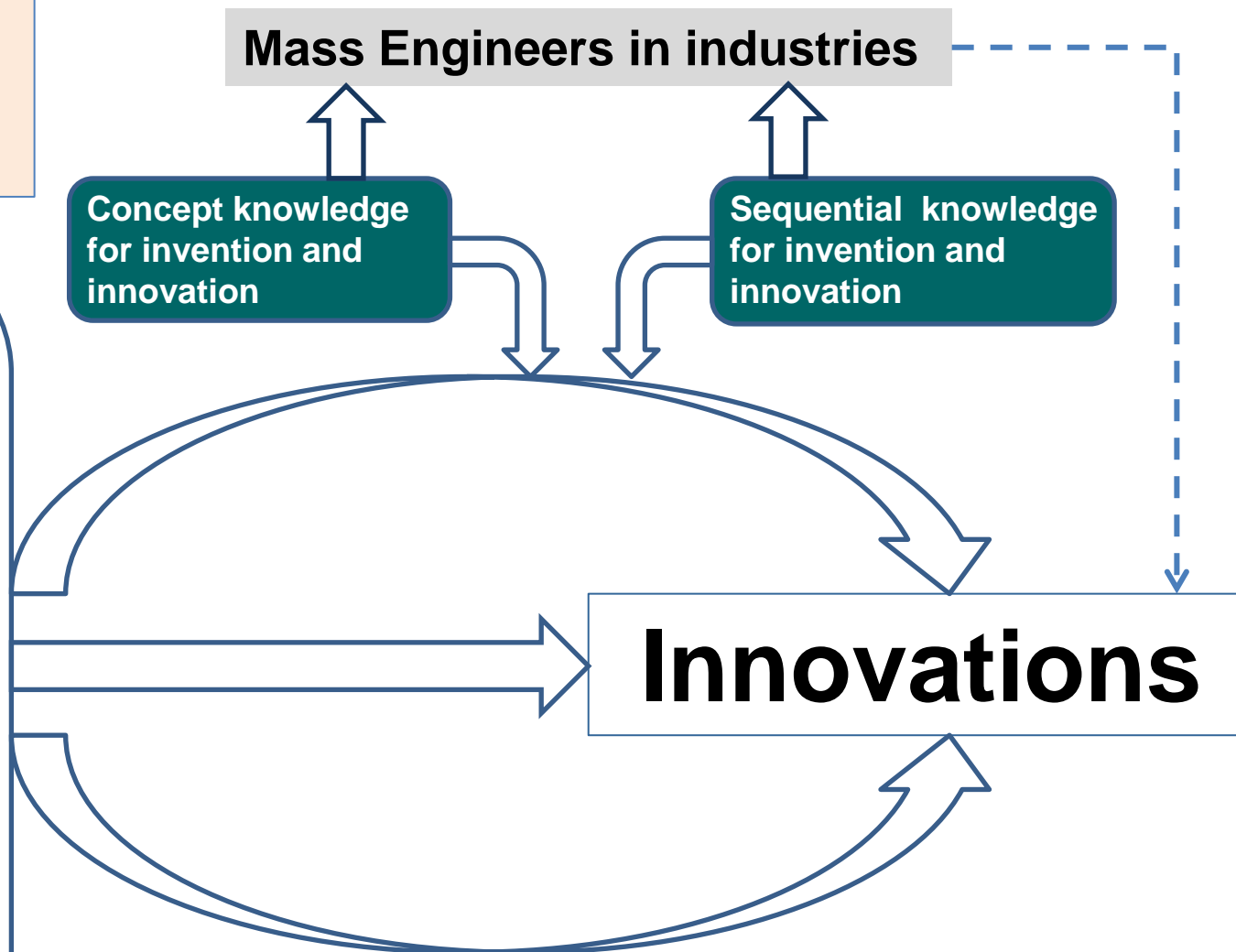


# Transformation of opportunities by training process

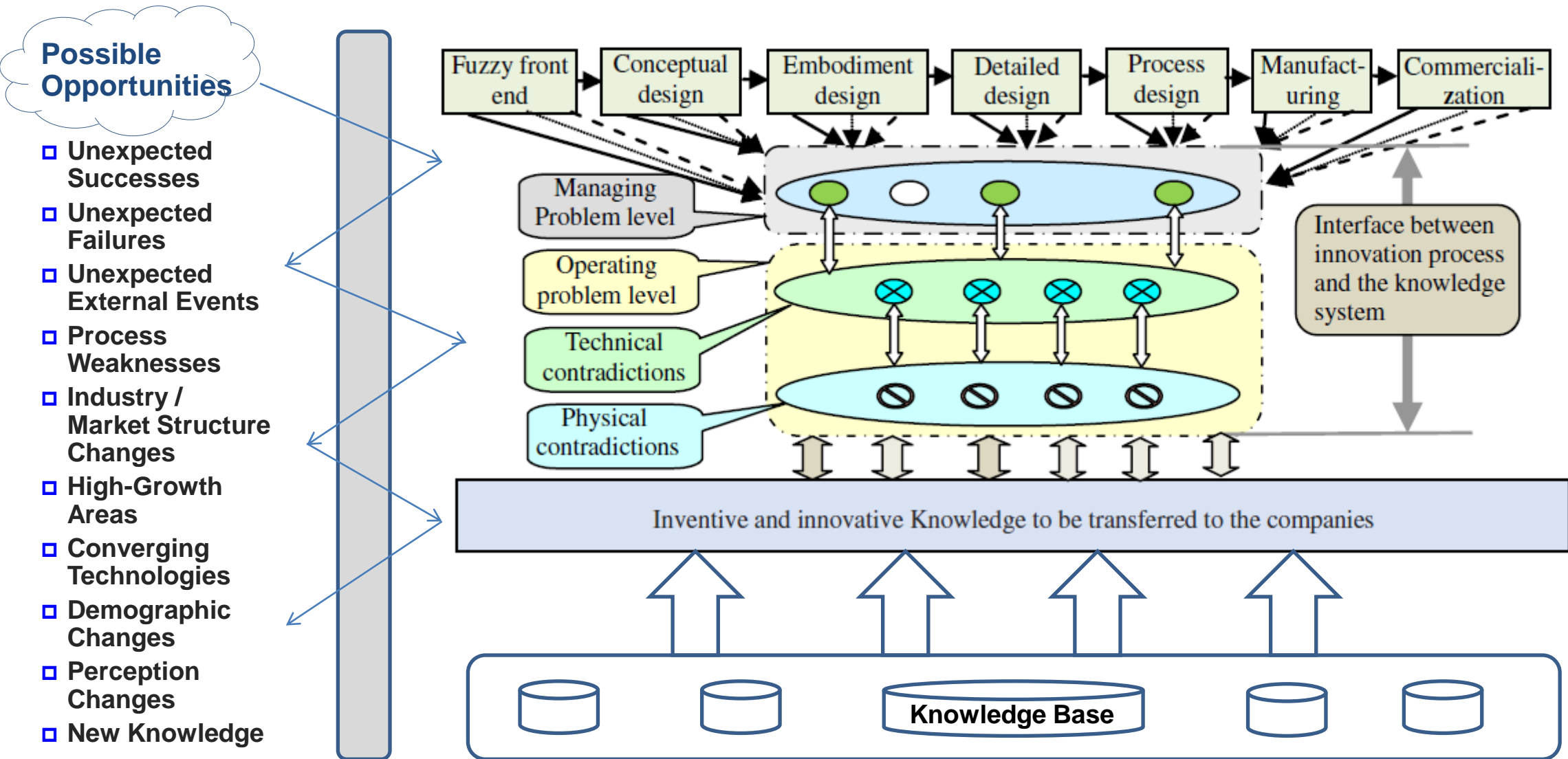
The capacity to turn cross domain knowledge-based inventions into commercially viable innovations is critical to radical and radical technological innovation for application of TRIZ.

## Possible Opportunities

- A. Unexpected Successes
- B. Unexpected Failures
- C. Unexpected External Events
- D. Process Weaknesses
- E. Industry / Market Structure Changes
- F. High-Growth Areas
- G. Converging Technologies
- H. Demographic Changes
- I. Perception Changes
- J. New Knowledge



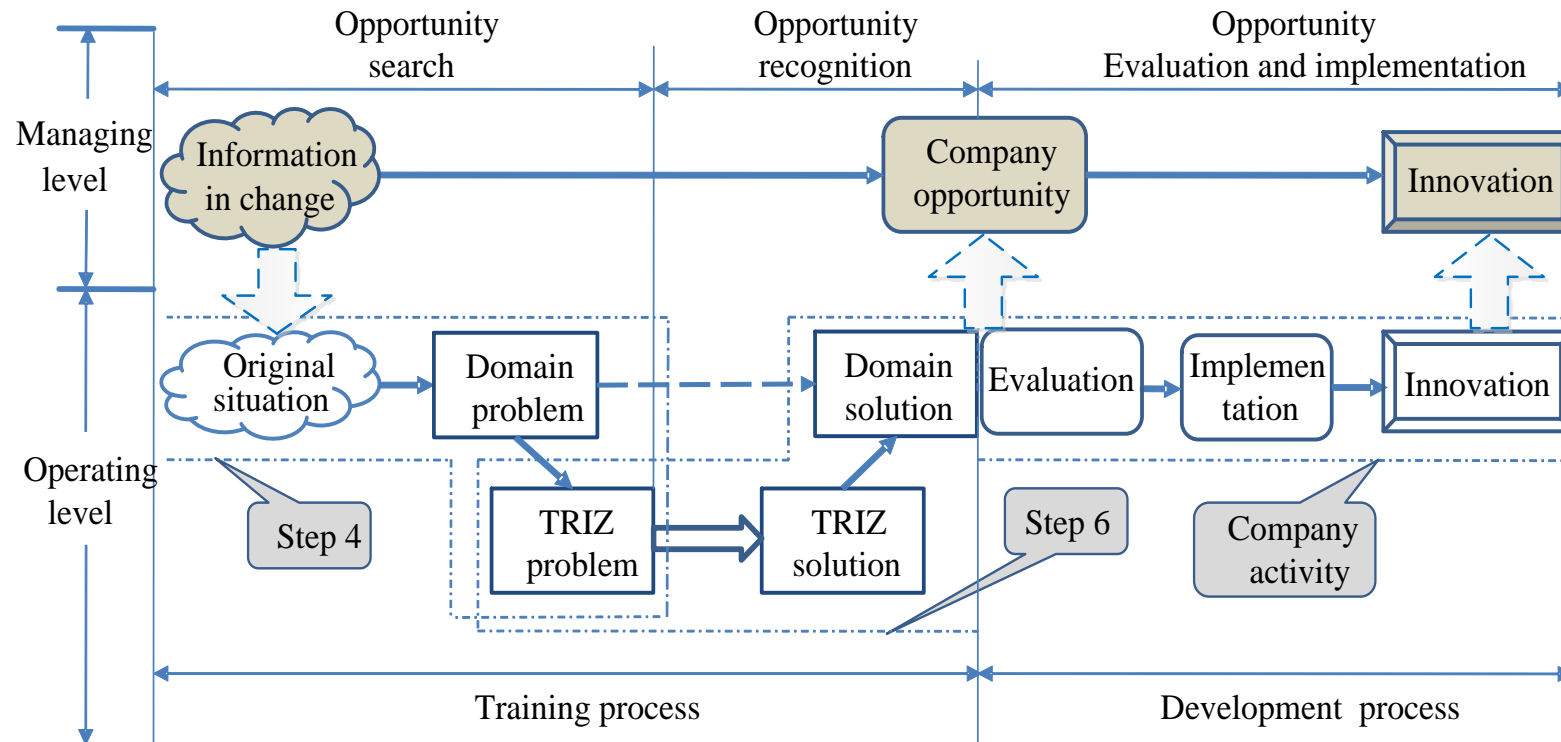
# Possible opportunities stimulate the innovation processes



Source: Tan

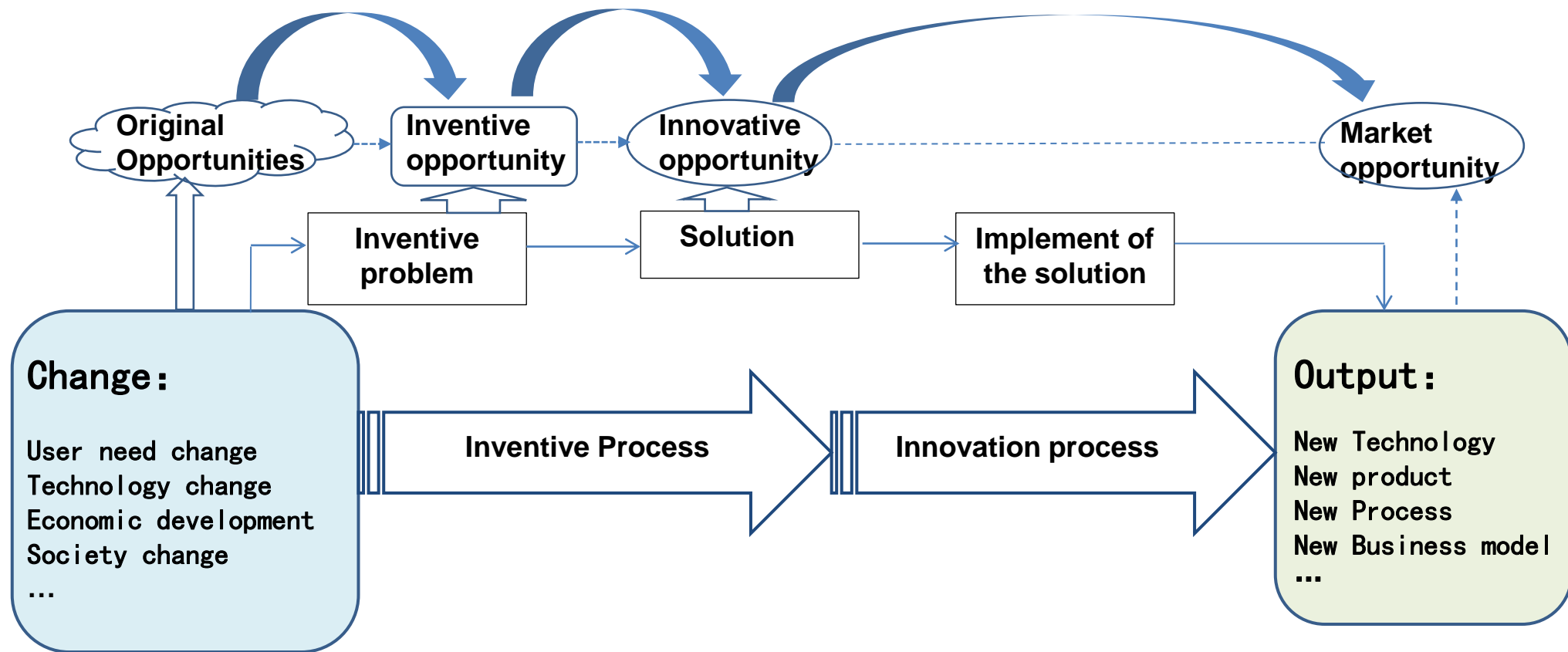


# Opportunity driven training process



Source: Tan 2017

# Transformation of the Opportunities

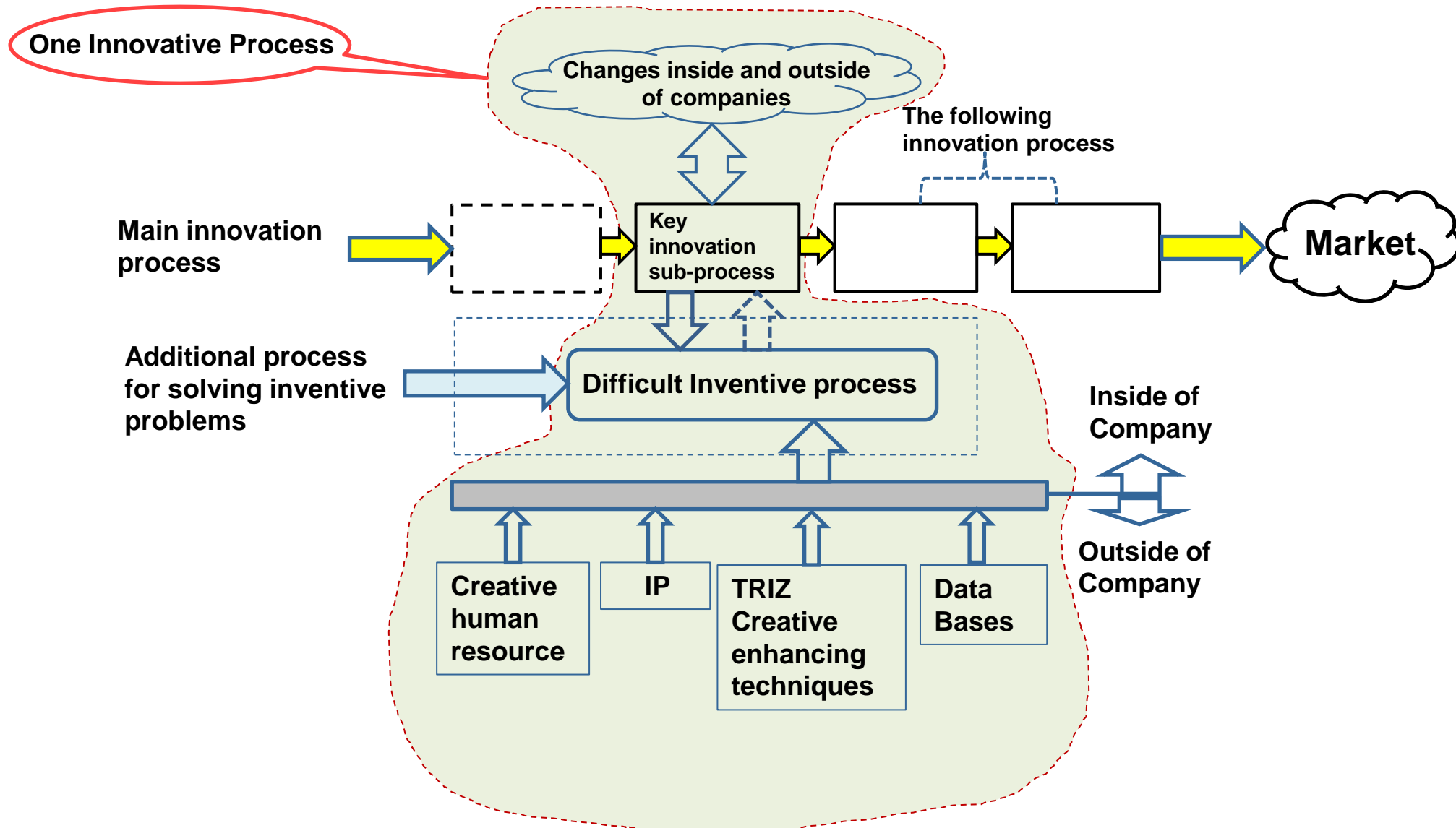


Transformation of the opportunity

Source: Tan



# One Inventive process

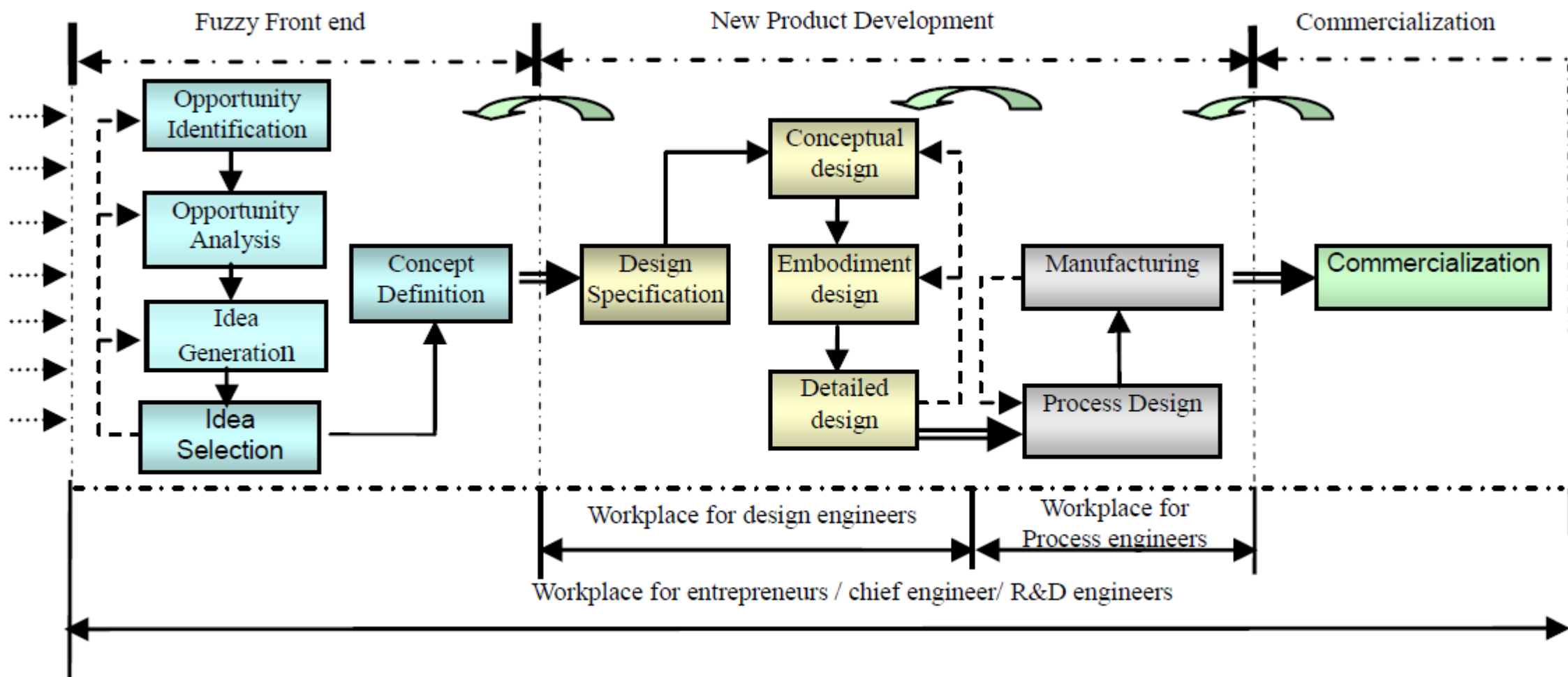


Source: Tan

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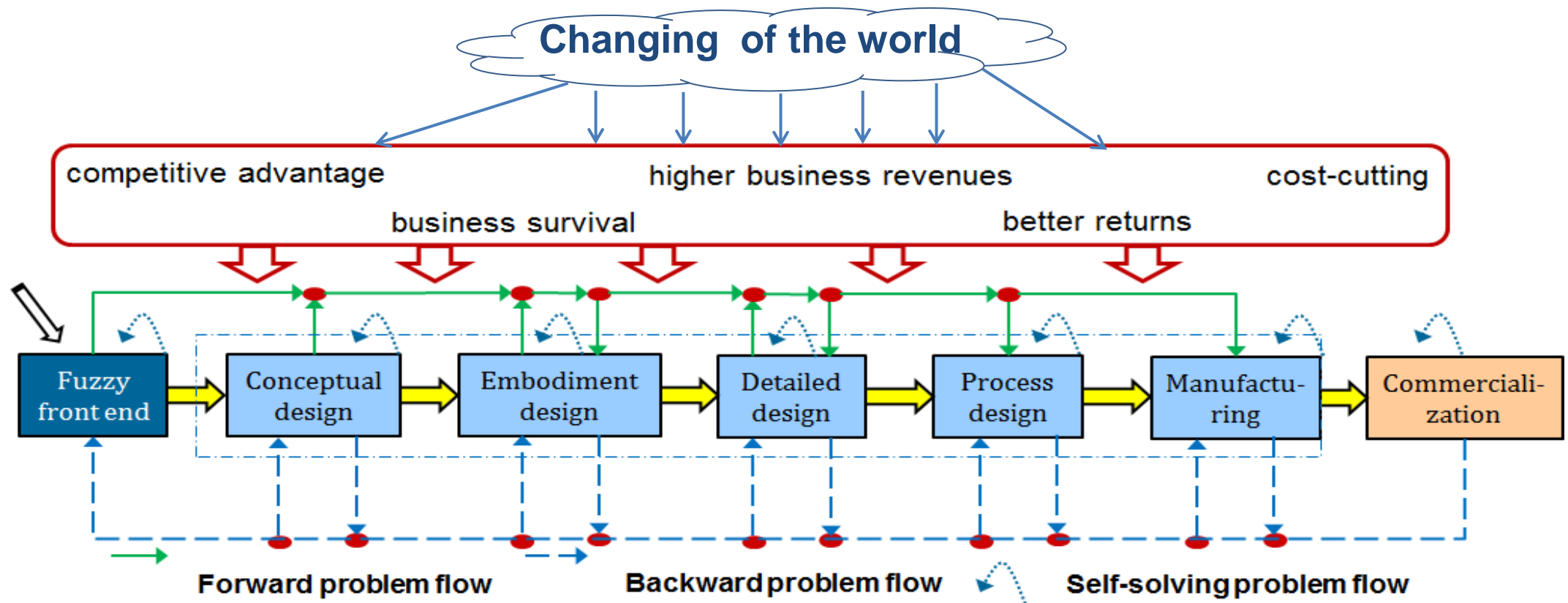
## **3. Major Research Topics In This Center**





**Figure 2. An innovation process and workplaces for engineers in a manufacturing company.**

# Problem flows in an innovation process

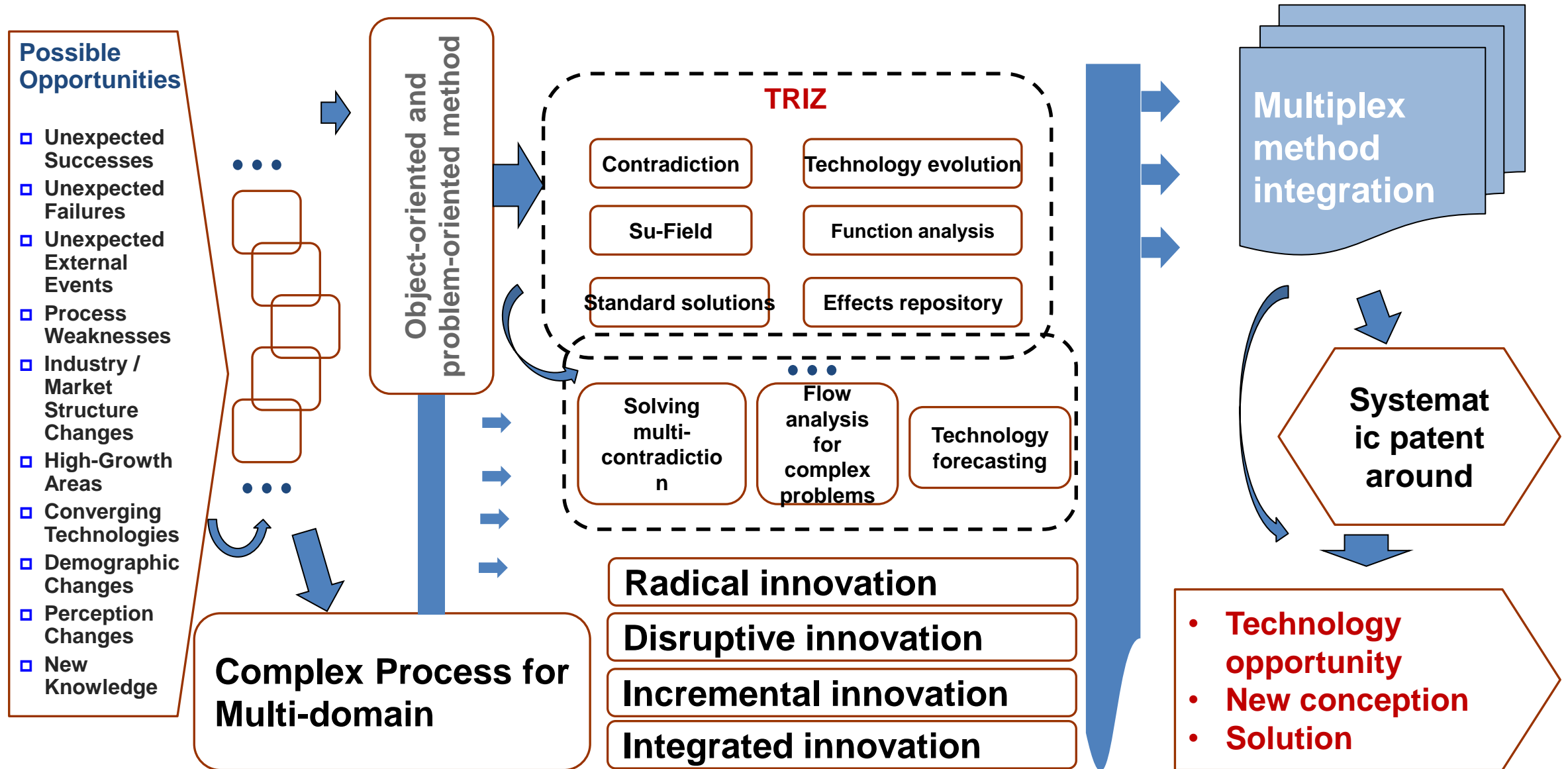


## Questions:

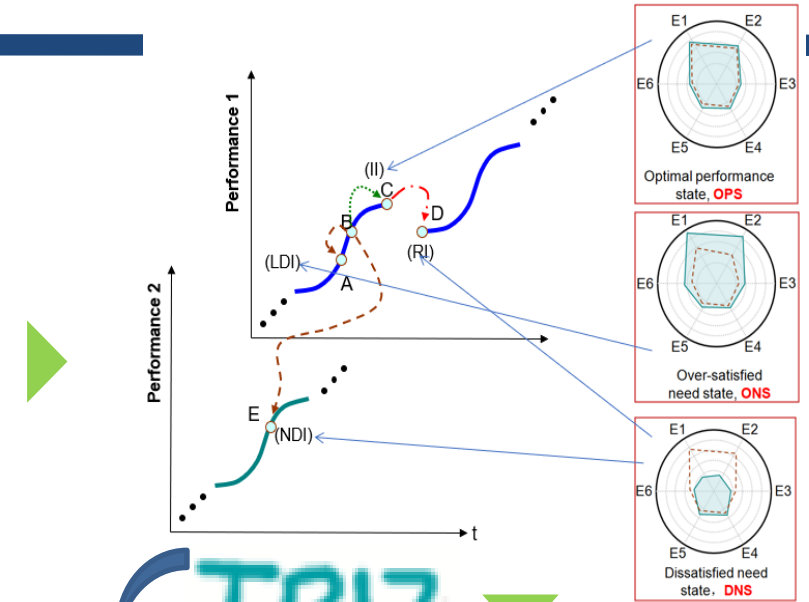
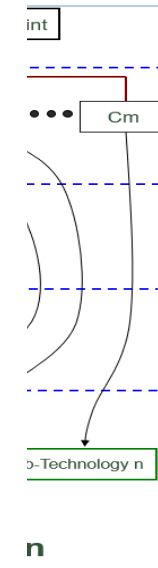
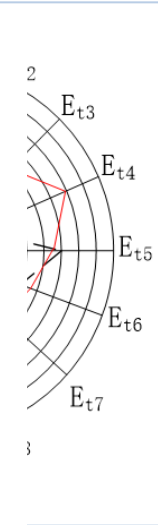
1. How to connect the training process with the innovation process in order to make more output for engineers?



# Integrated innovation system for multi-disciplines



# Achieve disruptive innovation



TRIZ

Low cost

Good shape

Energy saving

Simplified operation

Secondary functions

Enhanced

Secondary function

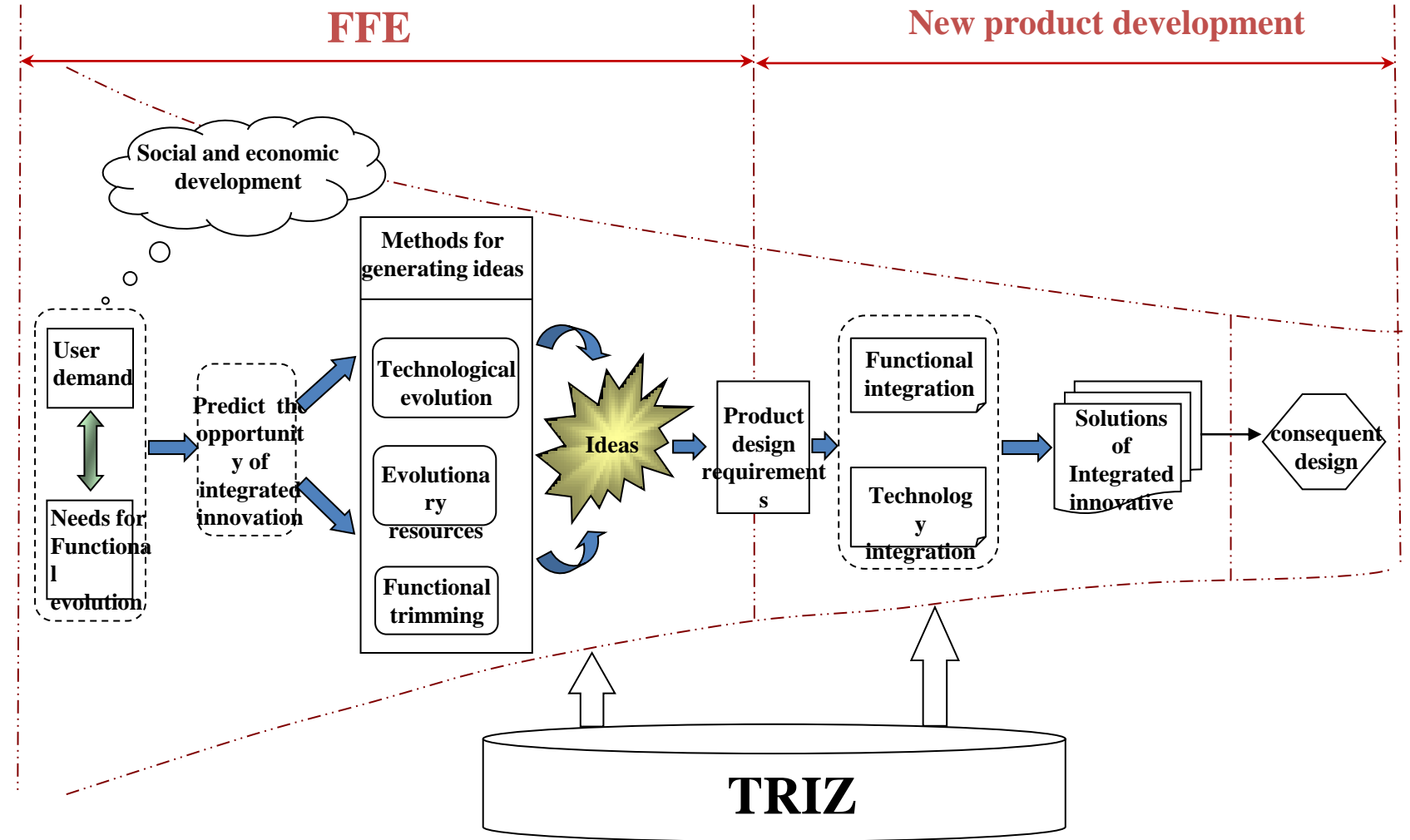
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ECONOMY  
PLAN  
ADVERTISING  
PROMOTION  
LIFE  
SOCIAL MEDIA  
SERVICES  
CONSUMER  
MEDIA  
PROJECTS  
ORGANIZATION  
WEB MARKETING  
CONSUMER DEMAND  
SOCIAL COMPUTER  
INTERNET  
ADVANCES  
PROGRAMMING  
TECHNOLOGY  
BUSINESS  
VISION  
ENGINEERING  
RESEARCH  
BRAND  
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WORLDWIDE  
BUZZ  
DATA  
ORGANIZATION  
PROPRICING  
SCIENCE  
SOCIAL NETWORKS



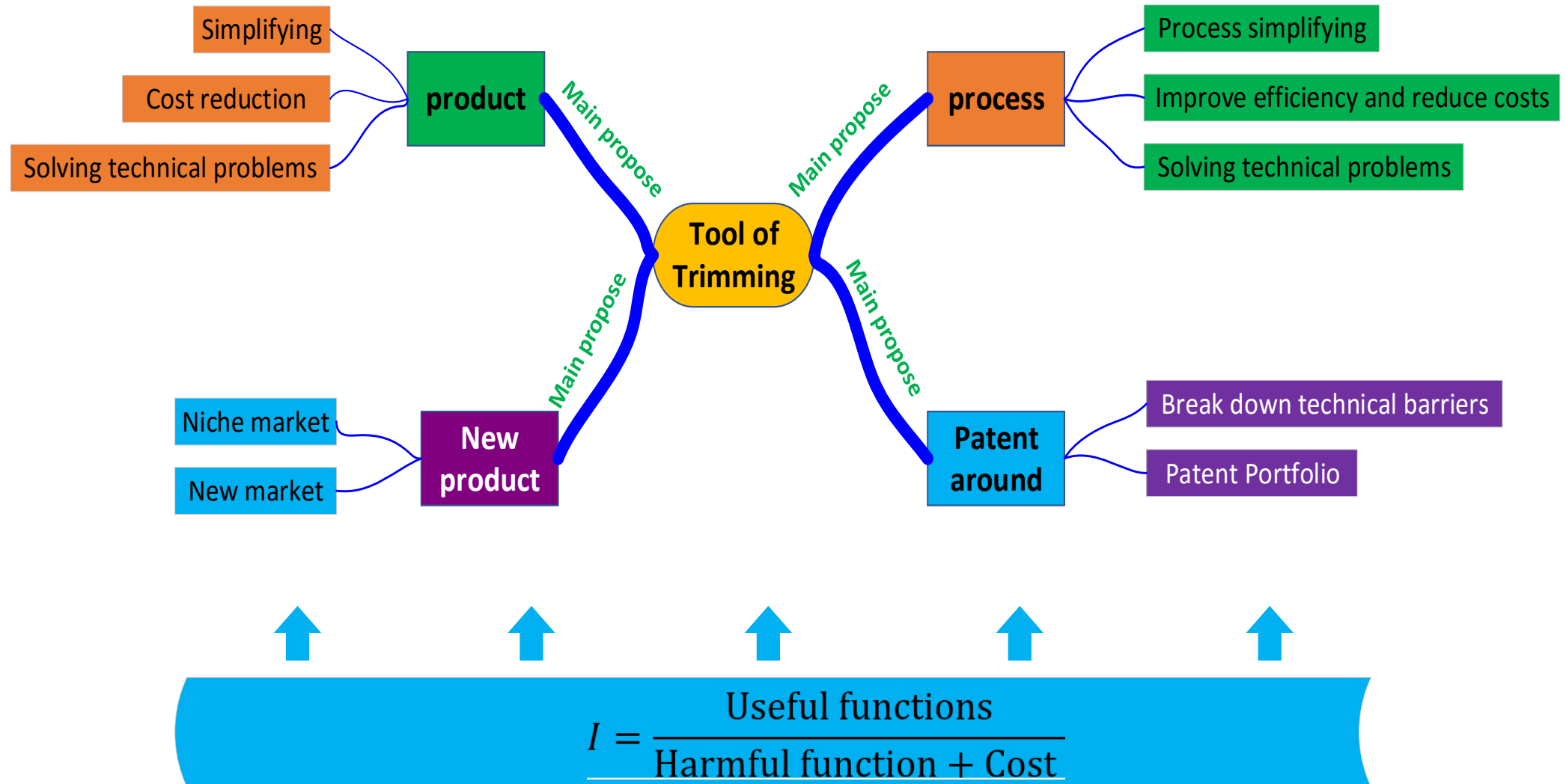
# Method for Integrated Innovation

□ Integrated innovation is defined as that designers integrate the elements of product innovation in a creative way based on the existing technology resources to develop a new product that satisfies customer needs.

□ The advantages are lower development cost, shorter design cycle, less risk, stronger adaptability and so on.

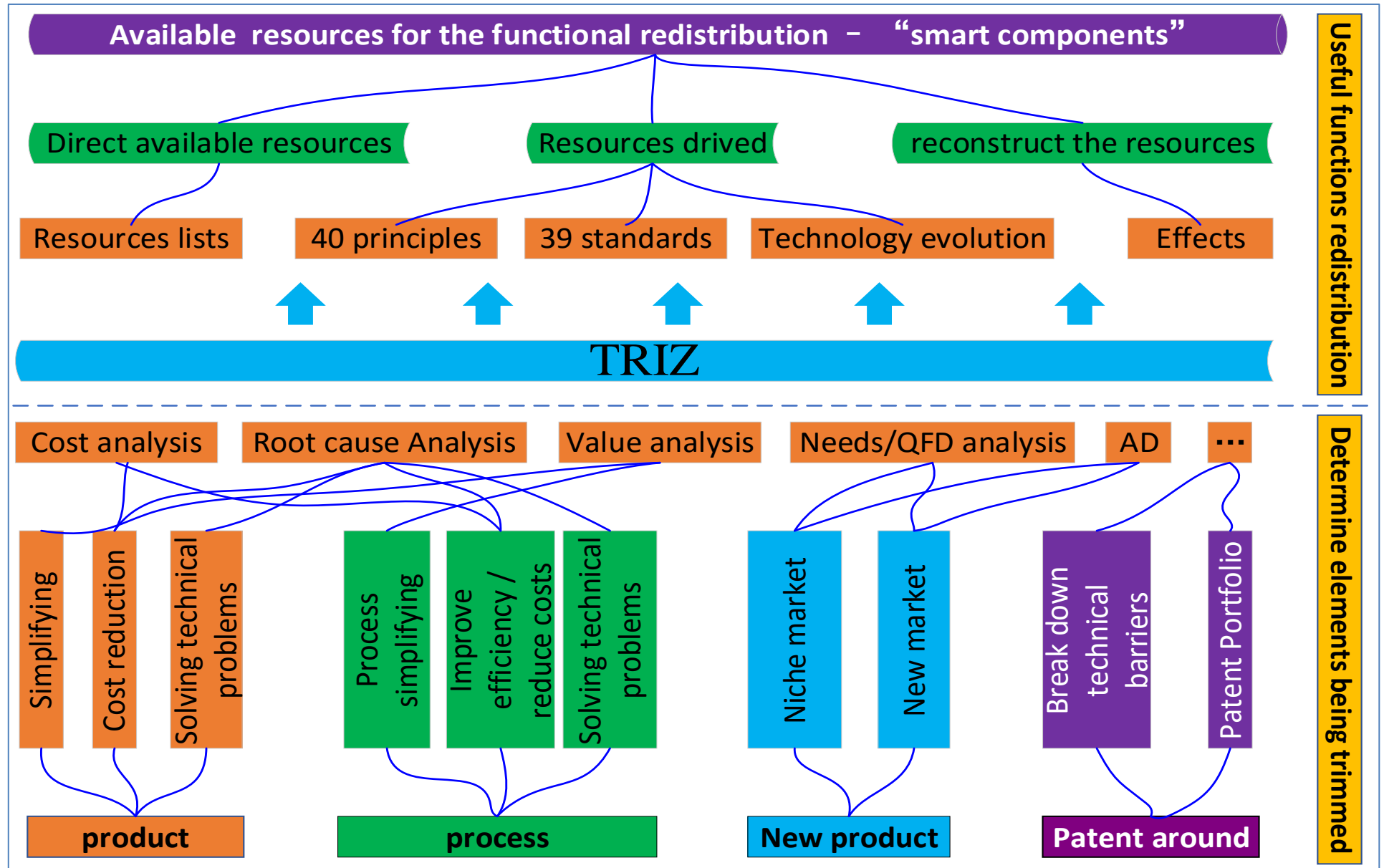


# The Propose of Using Trimming Method





“The  
frame  
of  
innovation  
with  
Trimming  
Method”

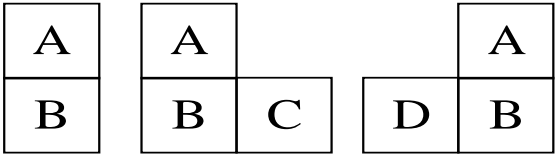


Useful functions redistribution

Determine elements being trimmed

# Patent Portfolio Classification

## Umbrella patent portfolio (complementary patent)



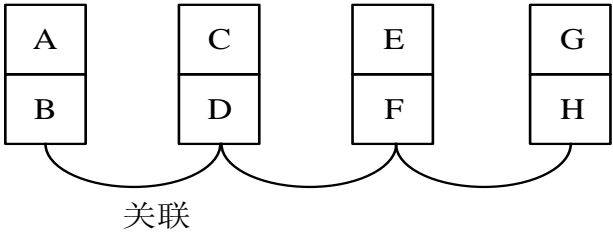
build a number of patents for different problems module of product system to form a complementary relationship between the patents

## Beam patent



patent portfolio classification

## Chain patent portfolio (supporting patent)



related technology patents for supporting the core product patent from upstream to downstream of product, expanding the impact of the industrial chain .



a series of new integrated patents of core patent technology and other solutions in different field , or technically patent in new field application .

## 4. Dissemination of TRIZ/C-TRIZ

- ❑ The purpose to disseminate TRIZ/C-TRIZ in industries is to make excellent engineers to “innovative engineers” .
- ❑ The industries in China need more and more innovative engineers, who are specialized in invention and will be serve their companies for a long time.
- ❑ Training “innovative engineers” is a big market now in China !
- ❑ Innovative engineers are “industry-specific inventors’.

We define that an innovative engineer is an industry-specific inventor, who has specific technical improvements for product designs or processes in their workplaces. The improvements include ideations and inventions.

Tan Runhua, Seven Stimuli to Identify Opportunities of Innovation: A Practice of Training Innovative Engineers and Some Findings in China.  
American Journal of Industrial and Business Management, 2013, 3, 725-739

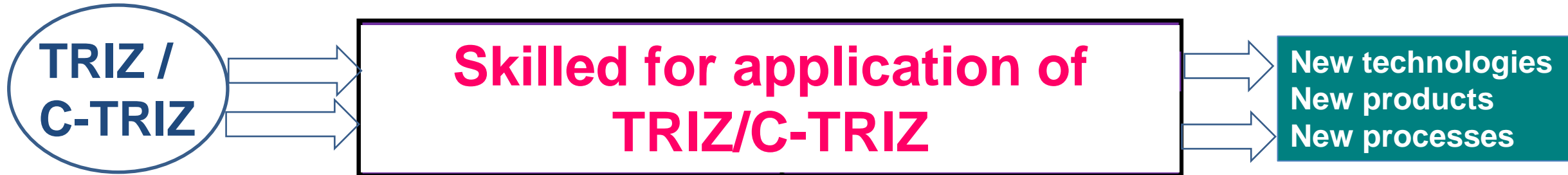
Inventors are divided into five categories related to the innovation process, namely entrepreneurs with technology, industry-specific inventors, professional inventors, grantsmen, and inveterate inventors.

C. L. Howard, S. L. David, and A. B. Marilyn, “Human Factors and the Innovation Process,”  
Technovation, Vol. 16, No. 4, 1996, pp. 173-186



# The Need for innovative engineers in industries

## T-Shaped Professionals (Both Deep and Broad)



### in 2015 The Future of Jobs

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity

### Developing T-shaped water professionals

International Water Centre,  
Water Policy 15 (2013) 42–60

### The 21st-Century T-Shaped Lawyer

Deep in At Least One Discipline  
Analytic Thinking & Problem Solving

Deep in At Least One System  
Analytic Thinking & Problem Solving

### Top 10 skills

#### in 2020 The Future of Jobs

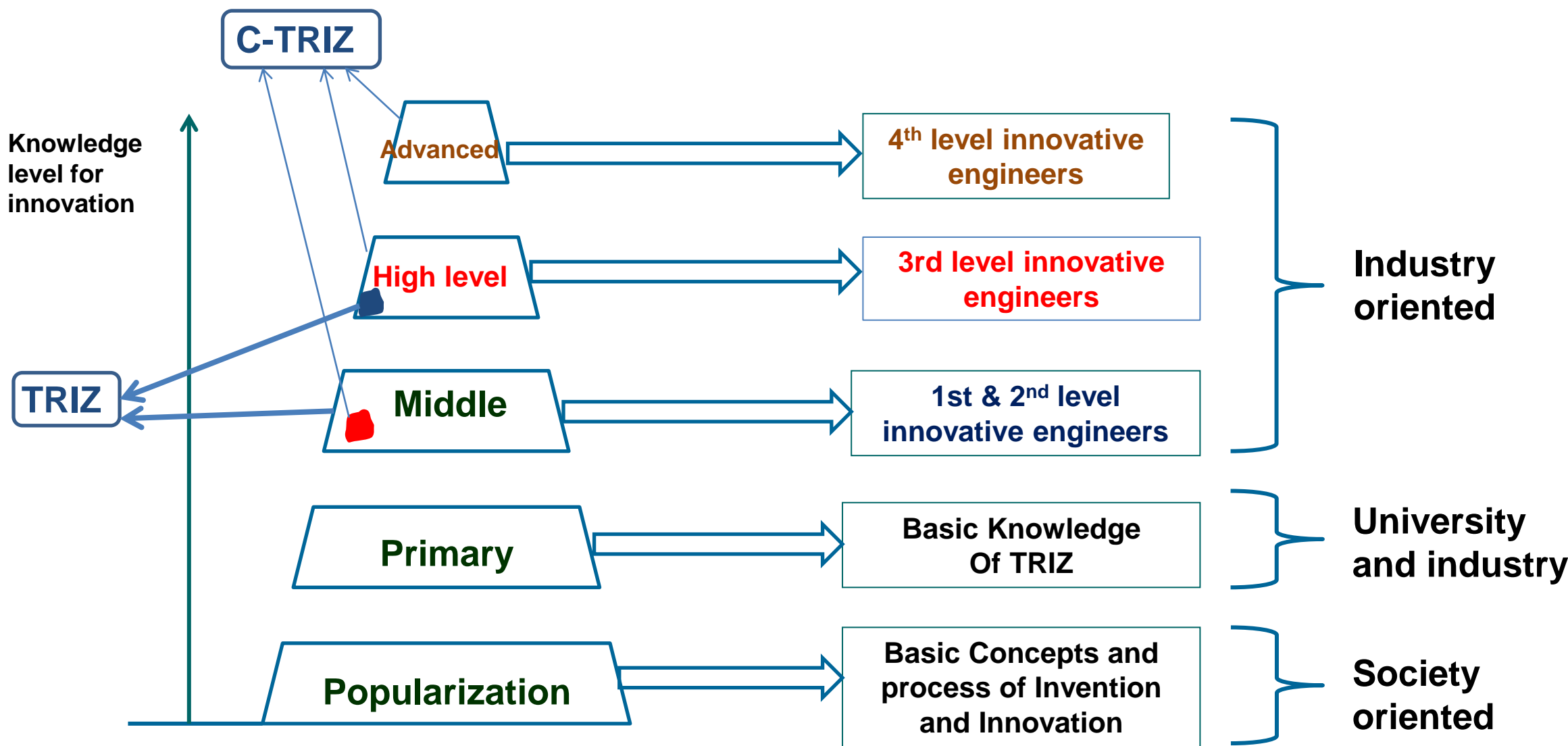
1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

Jim Spohrer, IBM Labs

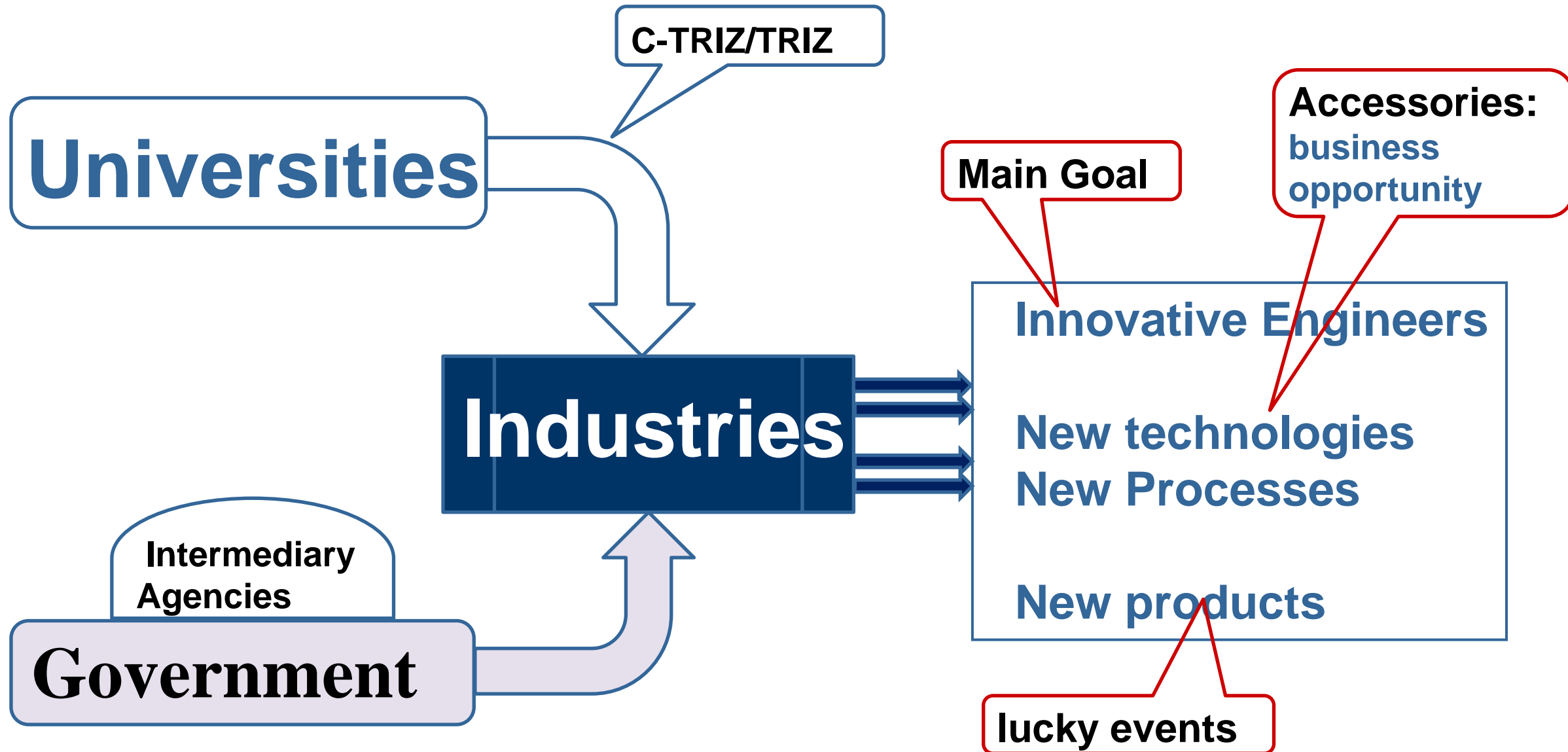


T-Shaped: The New Breed of IT Professional  
by Yassi Moghaddam, Charles Bess, Haluk Demirkan, and Jim Spohrer

# Five Levels Training Systems in this center



# Dissemination of C-TRIZ/TRIZ

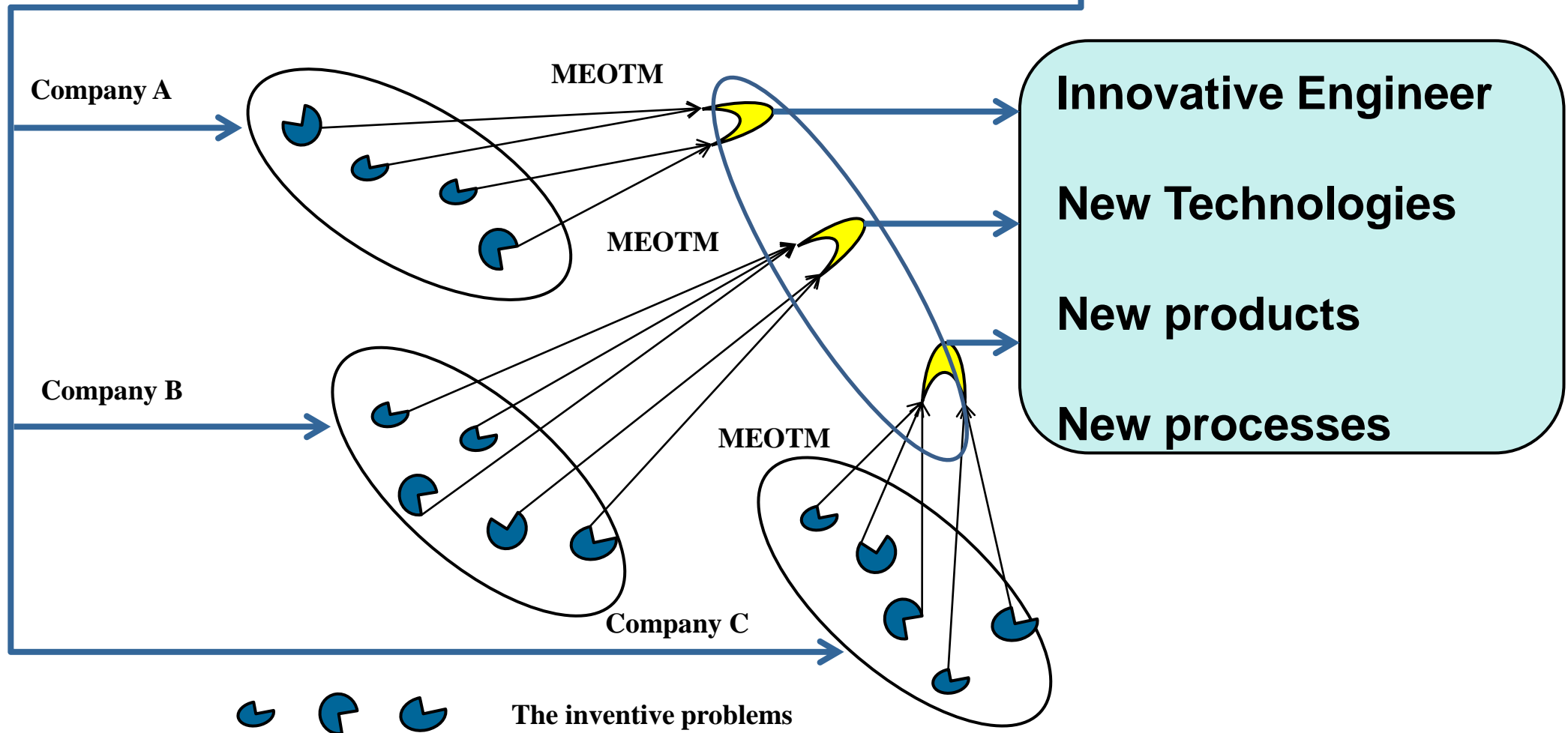




# The path of Dissemination

## Enabling Technologies for Innovation : C-TRIZ/TRIZ

Dissemination: government, intermediary agencies, bases



# Dissemination Model

## MEOTM: Mass-engineers-oriented training model of TRIZ in China

8 months to 15 months is needed for one class. The object is training engineers to find and solve an inventive problem under the guidance of classical TRIZ.

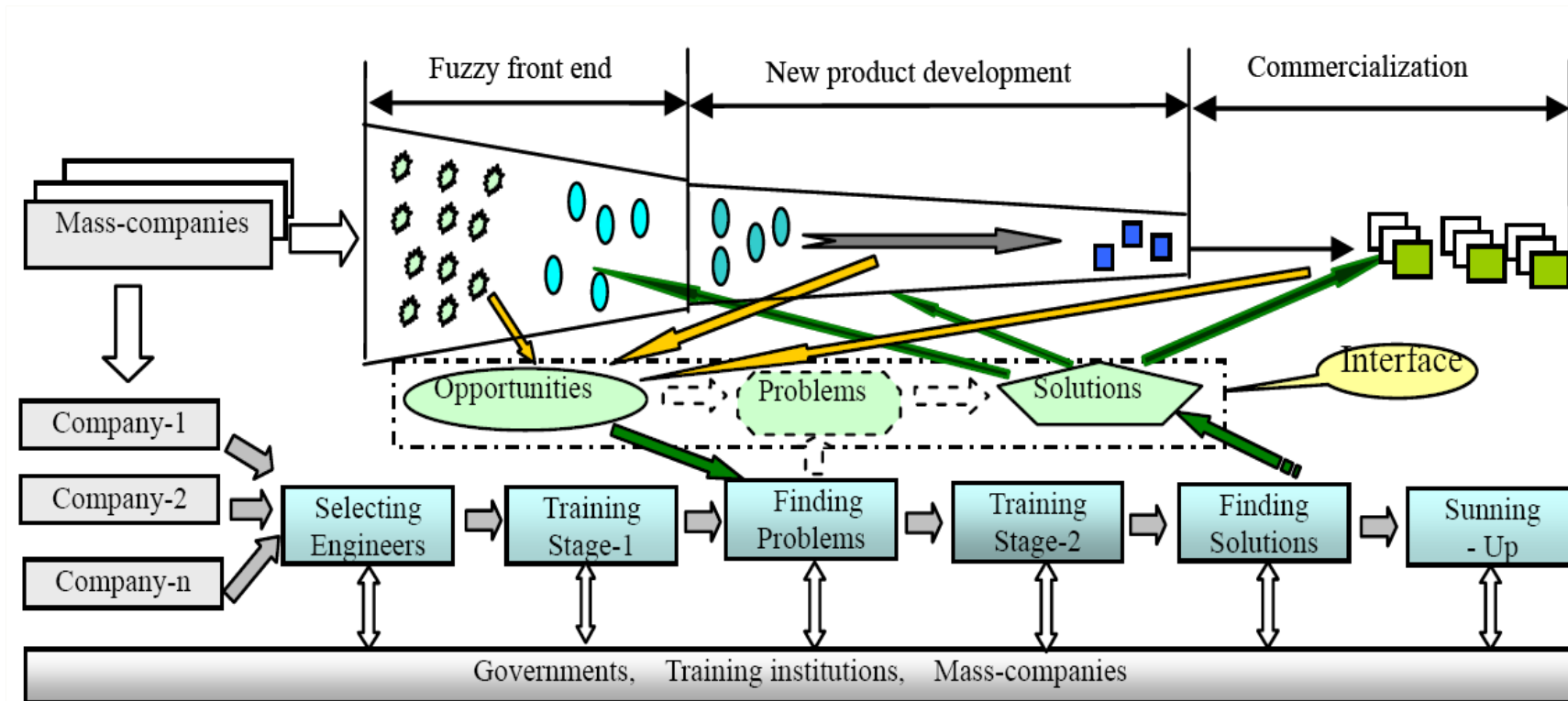
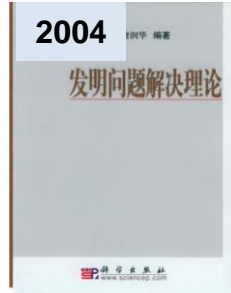
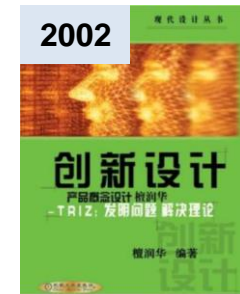
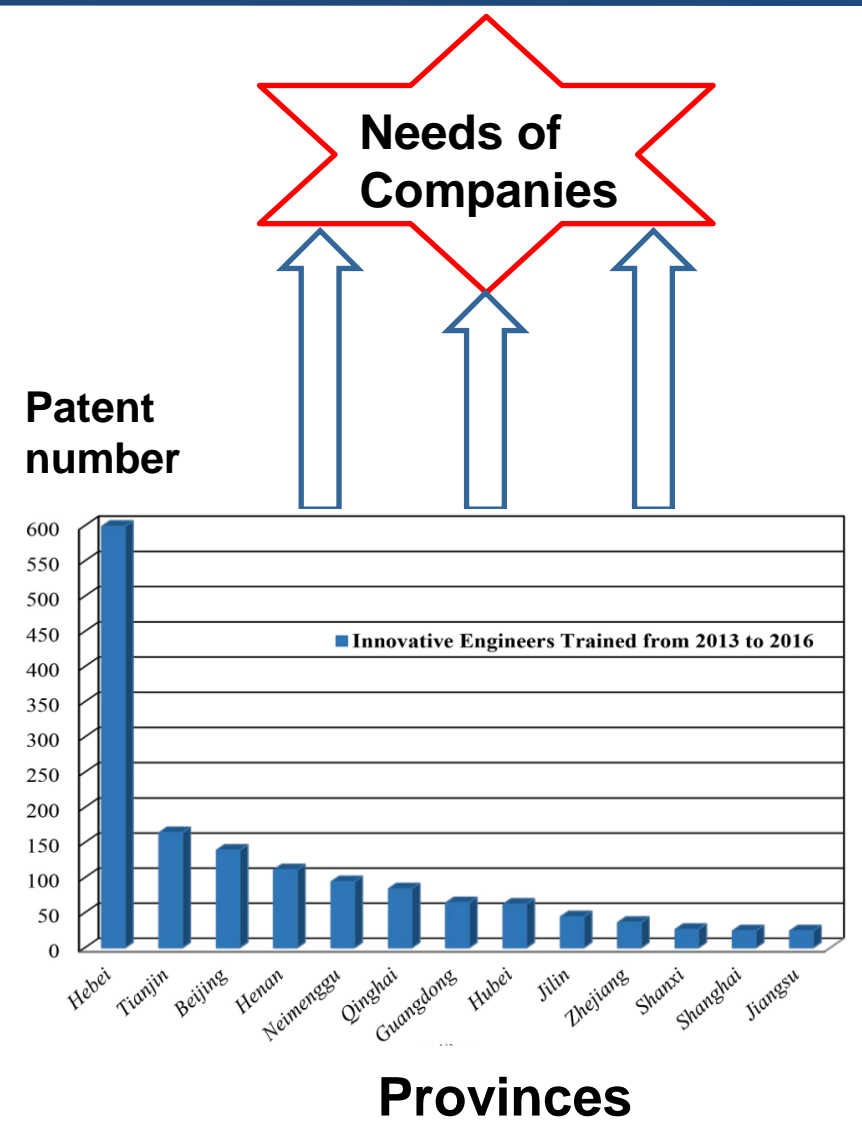
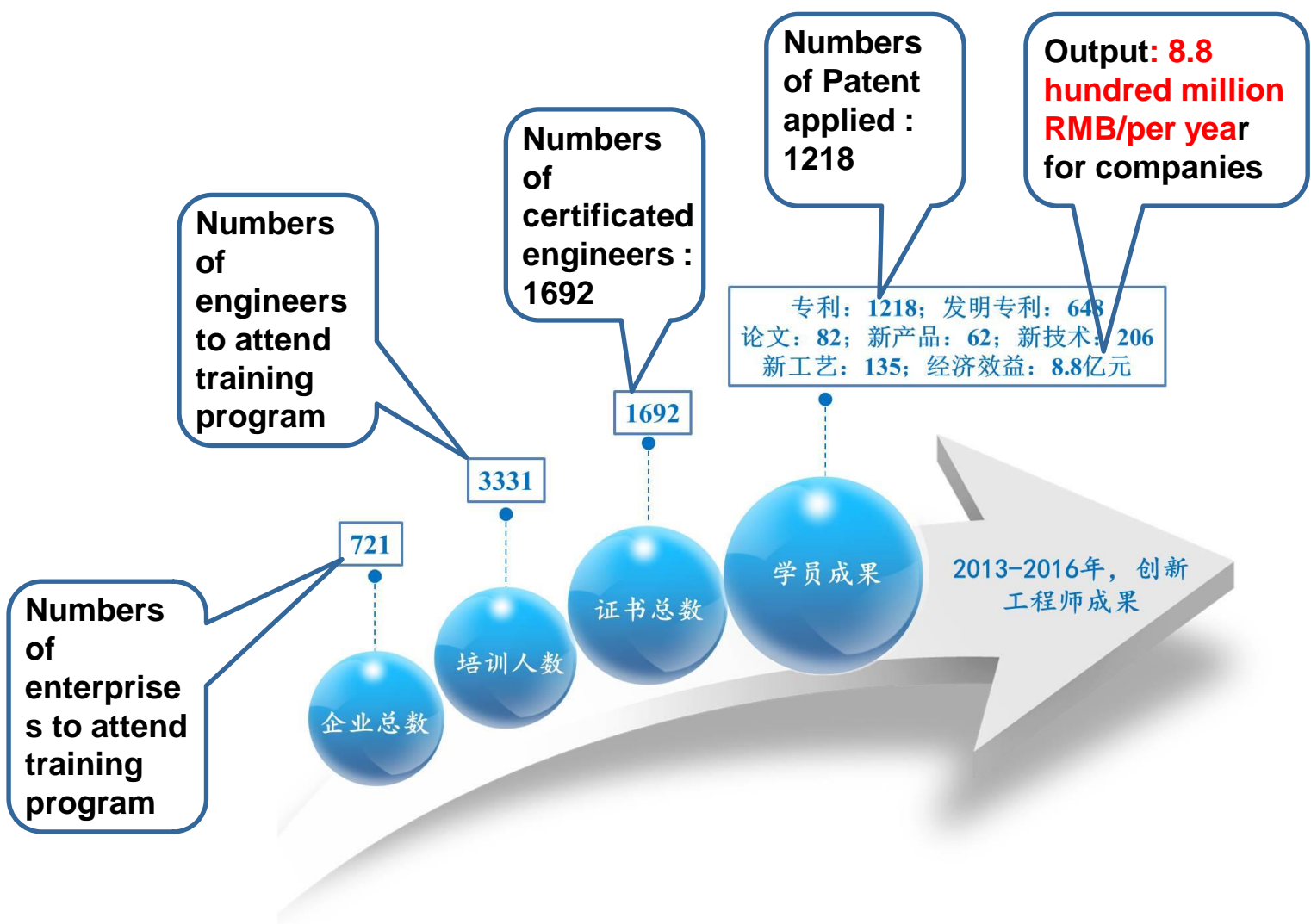


Figure 4. An interactive training model for innovative engineers in China.



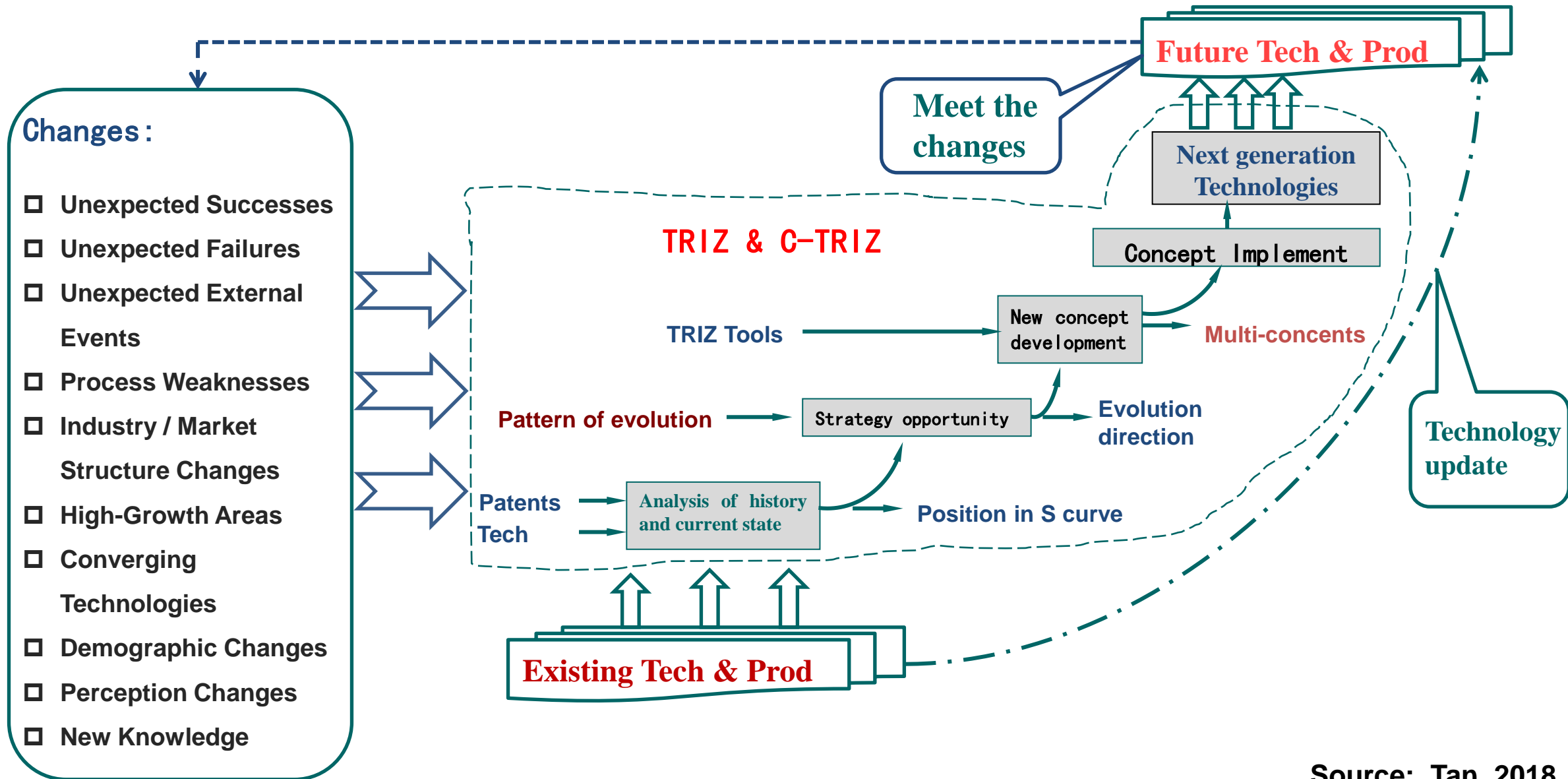
# The innovative engineers trained in this center

## From 2013 to 2016





# TRIZ/C-TRIZ guide the innovative paths of industries !



Source: Tan 2018

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## **5. Plan for the development of an international TRIZ research center**

# The funds and The location of The center

- ❑ We are trying to apply research funds from government to support the development of the international research center.
- ❑ Welcome the international experts of TRIZ or related Disciplines to pay more attention to the development of the center!
- ❑ The third floor of the building will be the center.





## 6. Conclusions

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- ❑ **“Mass-Engineer Innovation” is a pattern in industries in China.**
- ❑ **The pattern breeds many research topics for researchers of TRIZ and related areas.**
- ❑ **The situation produces opportunities for the center.**
- ❑ **The center hopes to co-operate with TRIZ experts, TRIZ Masters of the world in the future!**

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# Thank You!

**<http://www.triz.com.cn>**