

# *Data Science и ТРИЗ:*

*Пересечения?*

*Взаимодействие?!*

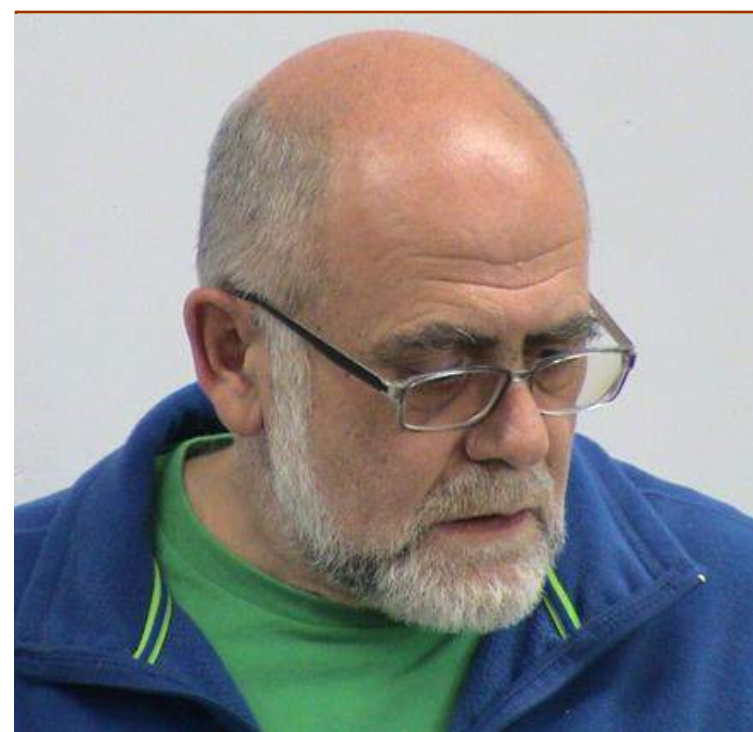
*Инсайты!*

*Наум Фейгенсон, Николай Таратин*

*Healbe Ltd, Санкт Петербург, Россия*

**SECR 2017**

**Software Engineering Conference Russia (Санкт-Петербург)**



*Наум Фейгенсон*

- *Инженер – исследователь*
- *27 лет опыта работы в инновационно-технологическом консалтинге, проекты для ведущих транснациональных корпораций*
- *ТРИЗ Мастер*



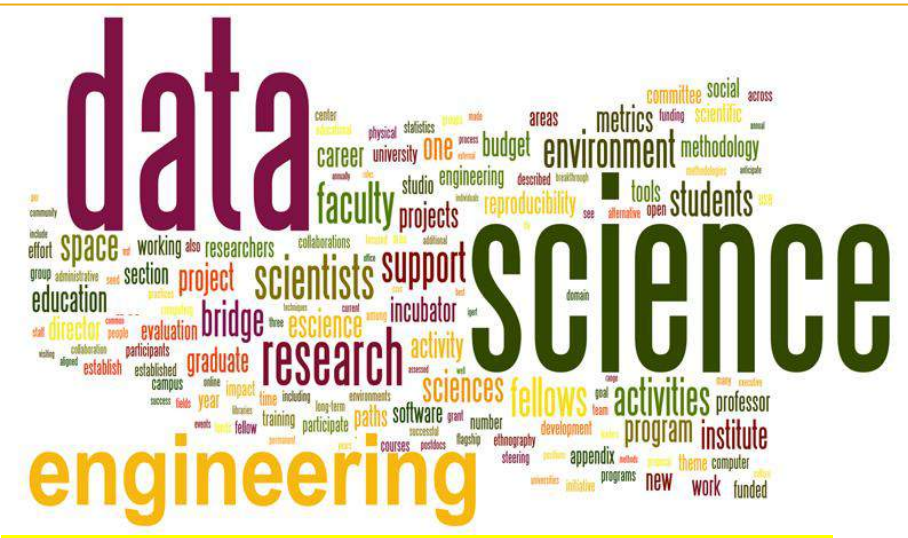
*Николай Таратин*

- *Аналитик данных*
- *Аналитик в центре инновационно-технологического консалтинга «Алгоритм».*
- *PhD (минералогия, кристаллография)*

**SECR 2017**

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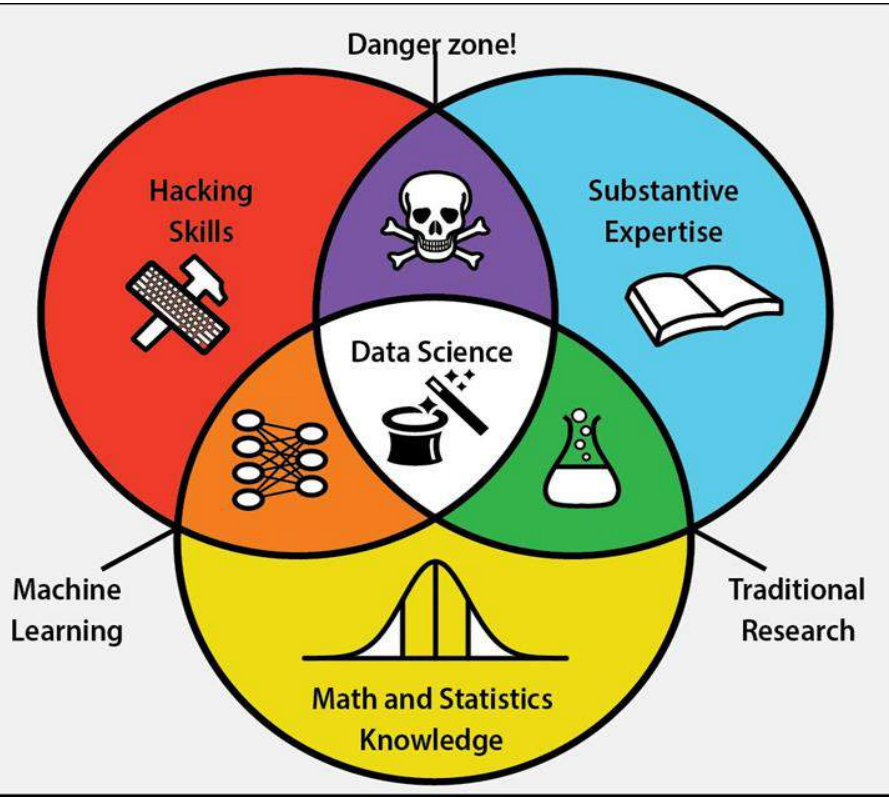
## ...С ВЫСОТЫ ПТИЧЬЕГО ПОЛЁТА...



[http://oec-vmweb02.ucsd.edu/uploads/news\\_release/2014/DataScienceEngineering\\_TagCloud\\_800.jpg](http://oec-vmweb02.ucsd.edu/uploads/news_release/2014/DataScienceEngineering_TagCloud_800.jpg)

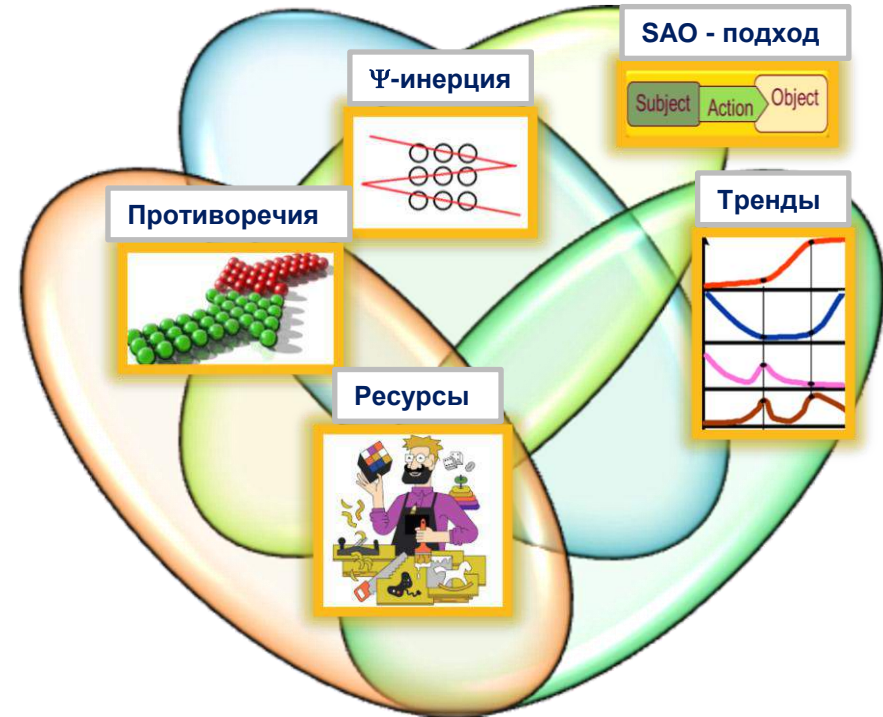
<http://www.tobiaslarsson.com/wp-content/uploads/BertoniLarssonEIAI-NeedsAndRequirements-HowTRIZMayBeAppliedInProductServiceDevelopment-2009-wordle.png>

Меж-  
дисциплинарное



[https://handong1587.github.io/data\\_science/2015/10/09/resources.html](https://handong1587.github.io/data_science/2015/10/09/resources.html)

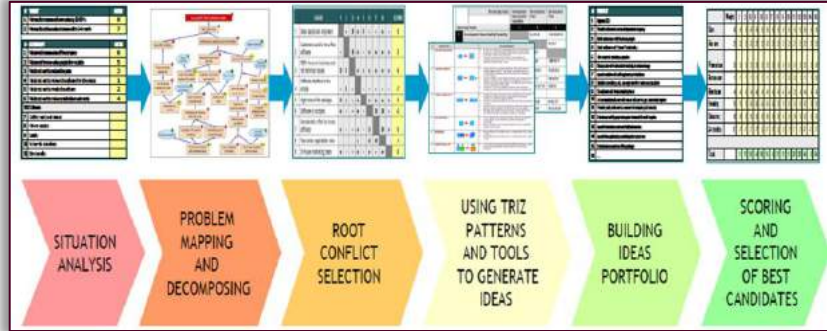
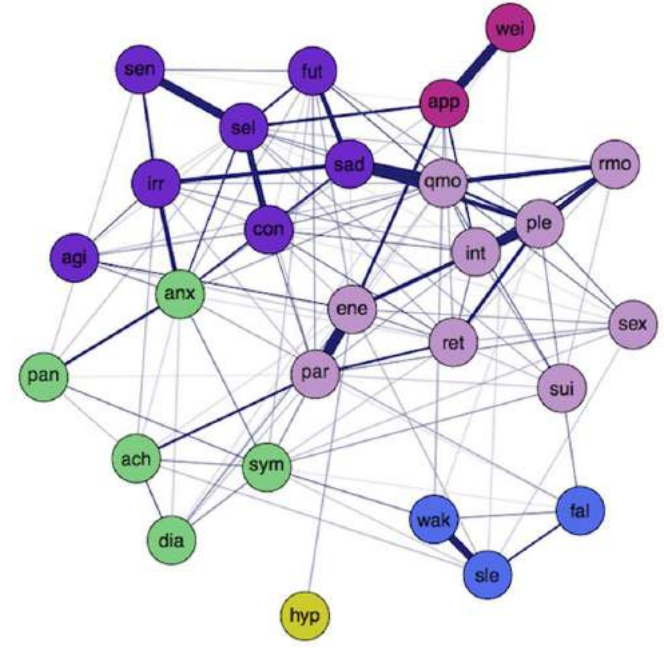
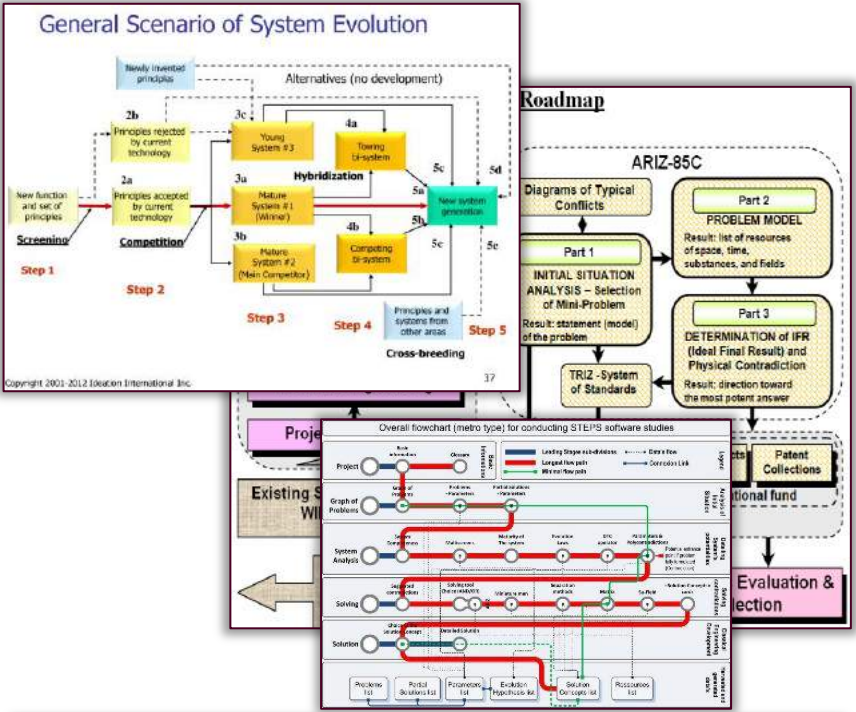
Кросс-  
дисциплинарное



# Структурированный процесс ....



- ❑ Сетевой характер ТРИЗ
- ❑ Кросс-дисциплинарность
- ❑ Поли-модельность



Ideation  
генерация идей

**Problem solving !!! →**



Relaxation →

Think again!



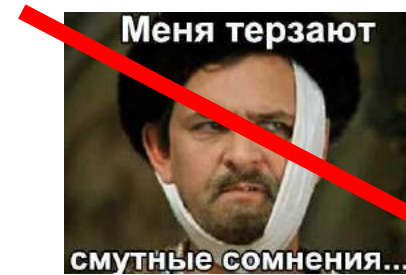
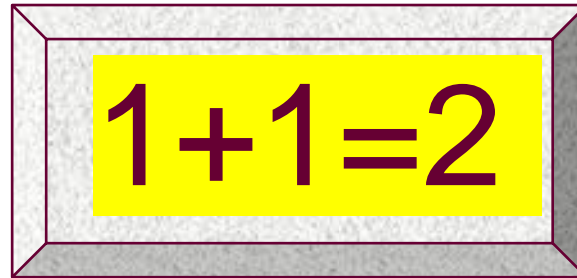
Think!  
Think!  
Think!



Think!

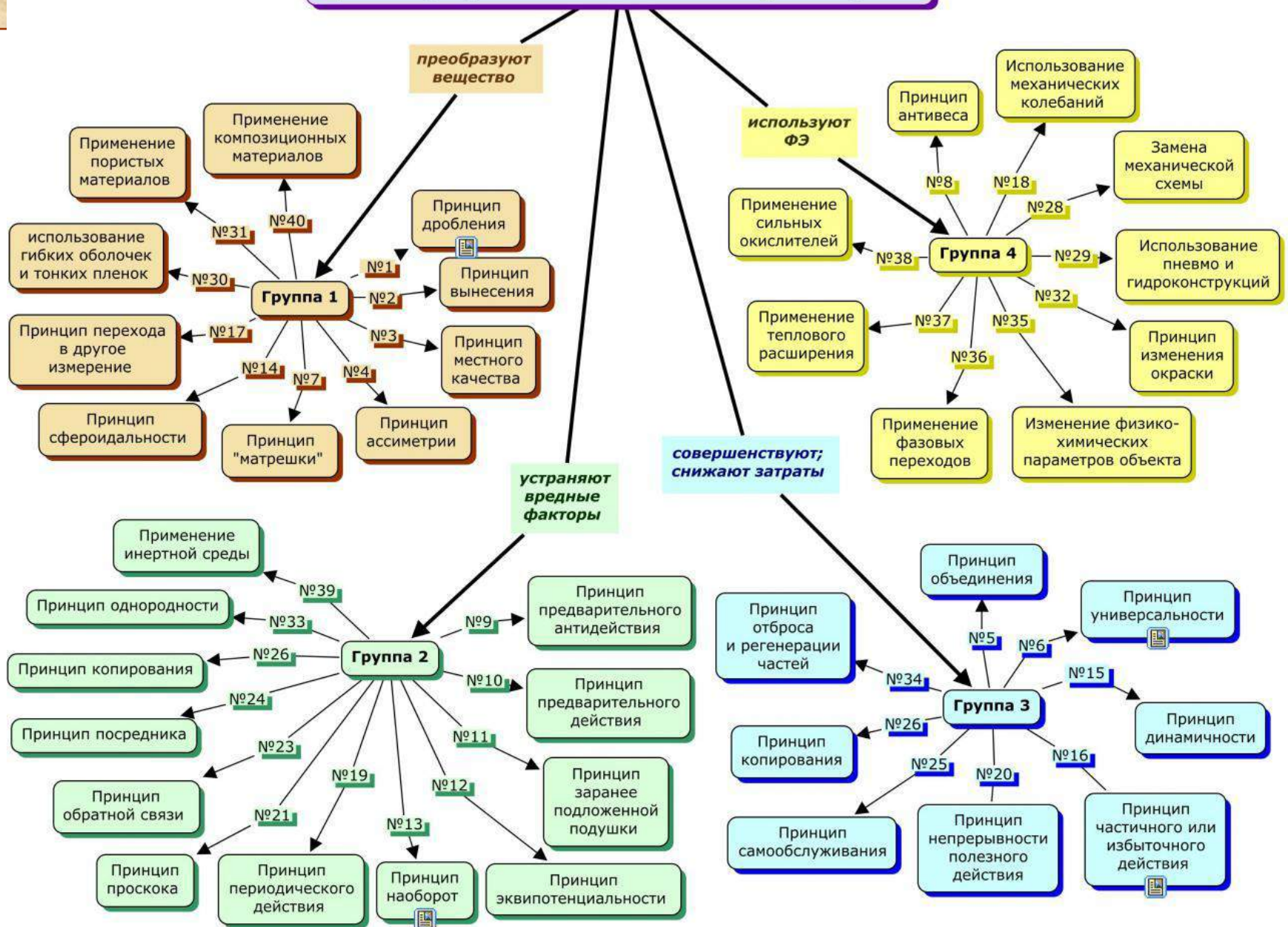


# Отличие науки от изобретательского подхода





# Приемы разрешения технических противоречий



# System of Inventive Principles GB TRIZ

<p><b>Use Resources</b></p> <p>Resources are energy, materials and information in the system and its environment.</p> <ul style="list-style-type: none"> <li>Find and use more resources.</li> <li>Use already used resources.</li> <li>Use under used resources.</li> <li>Use under used resources.</li> <li>Use already used resources.</li> <li>Use already used resources.</li> </ul>	<p><b>Use Time</b></p> <p>Use resources at the moment before, during process and after the process.</p> <ul style="list-style-type: none"> <li>Use available time resources.</li> <li>Use available time resources.</li> <li>Use available time resources.</li> <li>Use available time resources.</li> <li>Use available time resources.</li> </ul>	<p><b>Use Space</b></p> <p>Use resources in available space in the system and its environment.</p> <ul style="list-style-type: none"> <li>Use available space resources.</li> <li>Use available space resources.</li> <li>Use available space resources.</li> <li>Use available space resources.</li> <li>Use available space resources.</li> </ul>	<p><b>Change Structure</b></p> <p>Structure is the arrangement of system elements, their interactions.</p> <ul style="list-style-type: none"> <li>Change existing elements, their interactions in the system.</li> <li>Change existing elements, their interactions in the system.</li> <li>Change existing elements, their interactions in the system.</li> <li>Change existing elements, their interactions in the system.</li> <li>Change existing elements, their interactions in the system.</li> </ul>	<p><b>Change Conditions or Parameters</b></p> <p>Conditions and parameters are quantitative and qualitative attributes of the system operation.</p> <ul style="list-style-type: none"> <li>Change system conditions and parameters.</li> <li>Change system conditions and parameters.</li> <li>Change system conditions and parameters.</li> <li>Change system conditions and parameters.</li> <li>Change system conditions and parameters.</li> </ul>	
<p><b>Power/Energy</b></p> <p>Power/Energy is used as an energy source, resource.</p> <ul style="list-style-type: none"> <li>Find and use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> </ul>	<p><b>Preliminary action</b></p> <p>Performing something in advance with resources and objects that the system works with and on.</p> <ul style="list-style-type: none"> <li>Performing something in advance with resources and objects that the system works with and on.</li> <li>Performing something in advance with resources and objects that the system works with and on.</li> <li>Performing something in advance with resources and objects that the system works with and on.</li> <li>Performing something in advance with resources and objects that the system works with and on.</li> <li>Performing something in advance with resources and objects that the system works with and on.</li> </ul>	<p><b>Another dimension</b></p> <p>Use additional dimensions in a space resource.</p> <ul style="list-style-type: none"> <li>Use additional dimensions in a space resource.</li> <li>Use additional dimensions in a space resource.</li> <li>Use additional dimensions in a space resource.</li> <li>Use additional dimensions in a space resource.</li> <li>Use additional dimensions in a space resource.</li> </ul>	<p><b>Exclude</b></p> <p>Exclude something from the system.</p> <ul style="list-style-type: none"> <li>Exclude something from the system.</li> <li>Exclude something from the system.</li> <li>Exclude something from the system.</li> <li>Exclude something from the system.</li> <li>Exclude something from the system.</li> </ul>	<p><b>Partial action</b></p> <p>Perform something partially, when the system is working.</p> <ul style="list-style-type: none"> <li>Perform something partially, when the system is working.</li> <li>Perform something partially, when the system is working.</li> <li>Perform something partially, when the system is working.</li> <li>Perform something partially, when the system is working.</li> <li>Perform something partially, when the system is working.</li> </ul>	<p><b>Vaccination</b></p> <p>Use the system before, introduce to the system changes.</p> <ul style="list-style-type: none"> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> </ul>
<p><b>Elements</b></p> <p>System resources are objects, materials, substances, etc.</p> <ul style="list-style-type: none"> <li>Find and use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> </ul>	<p><b>Post process time</b></p> <p>Perform something and process with resources and objects that the system works with and on.</p> <ul style="list-style-type: none"> <li>Perform something and process with resources and objects that the system works with and on.</li> <li>Perform something and process with resources and objects that the system works with and on.</li> <li>Perform something and process with resources and objects that the system works with and on.</li> <li>Perform something and process with resources and objects that the system works with and on.</li> <li>Perform something and process with resources and objects that the system works with and on.</li> </ul>	<p><b>Asymmetry</b></p> <p>Use functions in asymmetry as resource.</p> <ul style="list-style-type: none"> <li>Use functions in asymmetry as resource.</li> <li>Use functions in asymmetry as resource.</li> <li>Use functions in asymmetry as resource.</li> <li>Use functions in asymmetry as resource.</li> <li>Use functions in asymmetry as resource.</li> </ul>	<p><b>Partitioning</b></p> <p>Divide something into objects.</p> <ul style="list-style-type: none"> <li>Divide something into objects.</li> <li>Divide something into objects.</li> <li>Divide something into objects.</li> <li>Divide something into objects.</li> <li>Divide something into objects.</li> </ul>	<p><b>Excessive action</b></p> <p>Perform more than needed the system.</p> <ul style="list-style-type: none"> <li>Perform more than needed the system.</li> <li>Perform more than needed the system.</li> <li>Perform more than needed the system.</li> <li>Perform more than needed the system.</li> <li>Perform more than needed the system.</li> </ul>	<p><b>Isolate</b></p> <p>Use the system before, introduce to the system changes.</p> <ul style="list-style-type: none"> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> <li>Use the system before, introduce to the system changes.</li> </ul>
<p><b>Information</b></p> <p>Information resources are changes in the system properties or its surroundings.</p> <ul style="list-style-type: none"> <li>Find and use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> </ul>	<p><b>Use pauses</b></p> <p>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</p> <ul style="list-style-type: none"> <li>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</li> <li>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</li> <li>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</li> <li>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</li> <li>Use of time pauses in a process to perform something with resources and objects that the system works with and on.</li> </ul>	<p><b>Nesting</b></p> <p>Place one object inside another.</p> <ul style="list-style-type: none"> <li>Place one object inside another.</li> <li>Place one object inside another.</li> <li>Place one object inside another.</li> <li>Place one object inside another.</li> <li>Place one object inside another.</li> </ul>	<p><b>Integrate</b></p> <p>Integrate something in the system to get a synergistic effect.</p> <ul style="list-style-type: none"> <li>Integrate something in the system to get a synergistic effect.</li> <li>Integrate something in the system to get a synergistic effect.</li> <li>Integrate something in the system to get a synergistic effect.</li> <li>Integrate something in the system to get a synergistic effect.</li> <li>Integrate something in the system to get a synergistic effect.</li> </ul>	<p><b>Matching</b></p> <p>Match functions or structures within a system.</p> <ul style="list-style-type: none"> <li>Match functions or structures within a system.</li> <li>Match functions or structures within a system.</li> <li>Match functions or structures within a system.</li> <li>Match functions or structures within a system.</li> <li>Match functions or structures within a system.</li> </ul>	<p><b>Counteract</b></p> <p>Counteract undesirable changes in the system.</p> <ul style="list-style-type: none"> <li>Counteract undesirable changes in the system.</li> <li>Counteract undesirable changes in the system.</li> <li>Counteract undesirable changes in the system.</li> <li>Counteract undesirable changes in the system.</li> <li>Counteract undesirable changes in the system.</li> </ul>
<p><b>Derived</b></p> <p>Derived resources become available after performing main resources.</p> <ul style="list-style-type: none"> <li>Find and use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> <li>Use available resources.</li> </ul>	<p><b>Accelerate</b></p> <p>Accelerate an activity, process, action or interaction.</p> <ul style="list-style-type: none"> <li>Accelerate an activity, process, action or interaction.</li> <li>Accelerate an activity, process, action or interaction.</li> <li>Accelerate an activity, process, action or interaction.</li> <li>Accelerate an activity, process, action or interaction.</li> <li>Accelerate an activity, process, action or interaction.</li> </ul>	<p><b>Take out the part</b></p> <p>Remove something out of the system.</p> <ul style="list-style-type: none"> <li>Remove something out of the system.</li> <li>Remove something out of the system.</li> <li>Remove something out of the system.</li> <li>Remove something out of the system.</li> <li>Remove something out of the system.</li> </ul>	<p><b>Mediator</b></p> <p>Use something as a mediator.</p> <ul style="list-style-type: none"> <li>Use something as a mediator.</li> <li>Use something as a mediator.</li> <li>Use something as a mediator.</li> <li>Use something as a mediator.</li> <li>Use something as a mediator.</li> </ul>	<p><b>Dynamism</b></p> <p>Make the system or its surrounding dynamic, adaptable or changeable.</p> <ul style="list-style-type: none"> <li>Make the system or its surrounding dynamic, adaptable or changeable.</li> <li>Make the system or its surrounding dynamic, adaptable or changeable.</li> <li>Make the system or its surrounding dynamic, adaptable or changeable.</li> <li>Make the system or its surrounding dynamic, adaptable or changeable.</li> <li>Make the system or its surrounding dynamic, adaptable or changeable.</li> </ul>	<p><b>Disposable</b></p> <p>Use something disposable instead of permanent one.</p> <ul style="list-style-type: none"> <li>Use something disposable instead of permanent one.</li> <li>Use something disposable instead of permanent one.</li> <li>Use something disposable instead of permanent one.</li> <li>Use something disposable instead of permanent one.</li> <li>Use something disposable instead of permanent one.</li> </ul>
<p><b>Intensify</b></p> <p>Intensify resources, energy and information resources, their concentration or functionality.</p> <ul style="list-style-type: none"> <li>Intensify resources, energy and information resources, their concentration or functionality.</li> <li>Intensify resources, energy and information resources, their concentration or functionality.</li> <li>Intensify resources, energy and information resources, their concentration or functionality.</li> <li>Intensify resources, energy and information resources, their concentration or functionality.</li> <li>Intensify resources, energy and information resources, their concentration or functionality.</li> </ul>	<p><b>Decelerate</b></p> <p>Decelerate an activity, process, action or interaction.</p> <ul style="list-style-type: none"> <li>Decelerate an activity, process, action or interaction.</li> <li>Decelerate an activity, process, action or interaction.</li> <li>Decelerate an activity, process, action or interaction.</li> <li>Decelerate an activity, process, action or interaction.</li> <li>Decelerate an activity, process, action or interaction.</li> </ul>	<p><b>Localize</b></p> <p>Localize something into a specific space.</p> <ul style="list-style-type: none"> <li>Localize something into a specific space.</li> <li>Localize something into a specific space.</li> <li>Localize something into a specific space.</li> <li>Localize something into a specific space.</li> <li>Localize something into a specific space.</li> </ul>	<p><b>Copy</b></p> <p>Make a copy of the system.</p> <ul style="list-style-type: none"> <li>Make a copy of the system.</li> <li>Make a copy of the system.</li> <li>Make a copy of the system.</li> <li>Make a copy of the system.</li> <li>Make a copy of the system.</li> </ul>	<p><b>Controllability</b></p> <p>Increase controllability of the system.</p> <ul style="list-style-type: none"> <li>Increase controllability of the system.</li> <li>Increase controllability of the system.</li> <li>Increase controllability of the system.</li> <li>Increase controllability of the system.</li> <li>Increase controllability of the system.</li> </ul>	<p><b>Invention</b></p> <p>Change properties of the system or its elements.</p> <ul style="list-style-type: none"> <li>Change properties of the system or its elements.</li> <li>Change properties of the system or its elements.</li> <li>Change properties of the system or its elements.</li> <li>Change properties of the system or its elements.</li> <li>Change properties of the system or its elements.</li> </ul>



Рене Магритт  
называвший себя «магическим реалистом»

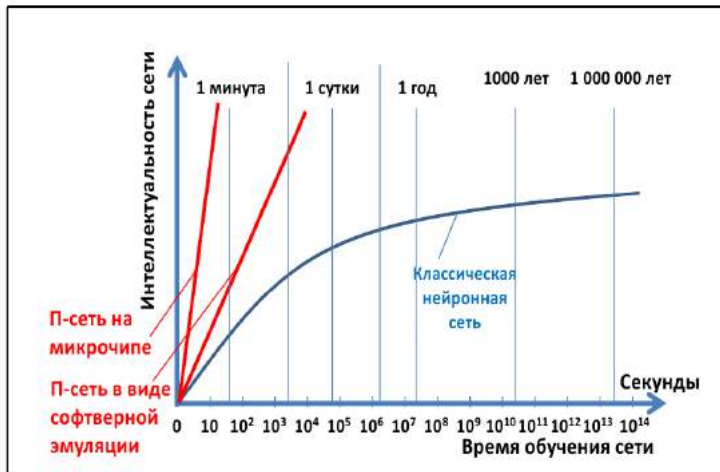
# «...МЫ НЕ ОДИНОКИ ВО ВСЕЛЕННОЙ...»

## Analog and Digital Modeling of a Scalable Neural Network

D. Pescianschi<sup>1</sup>, A. Boudichevskaia<sup>1,2</sup>, B. Zlotin<sup>1</sup>, and V. Proseanic<sup>1</sup>

### Аннотация

Описывается новый тип нейронных сетей (п-сети), способных к быстрому обучению и не подверженных типичным для классических нейронных сетей проблемам. Приводятся данные экспериментов по сравнению предложенной сети с имеющимися на рынке классическими нейронными сетями, описываются перспективные направления использования п-сетей в ТРИЗ и в бизнесе.



KEYNOTE 2. Simon Dewulf, CEO, AULIVE Co.

"BIG DATA for A.I. and BIG Patent DATA for Innovation Logic"

<https://www.lut.fi/documents/27578/452786/Schedule+TFCoct3.pdf/d82be84c-f863-46cd-a015-84aeaed64763>

THE 13th INTERNATIONAL MATRIZ CONFERENCE

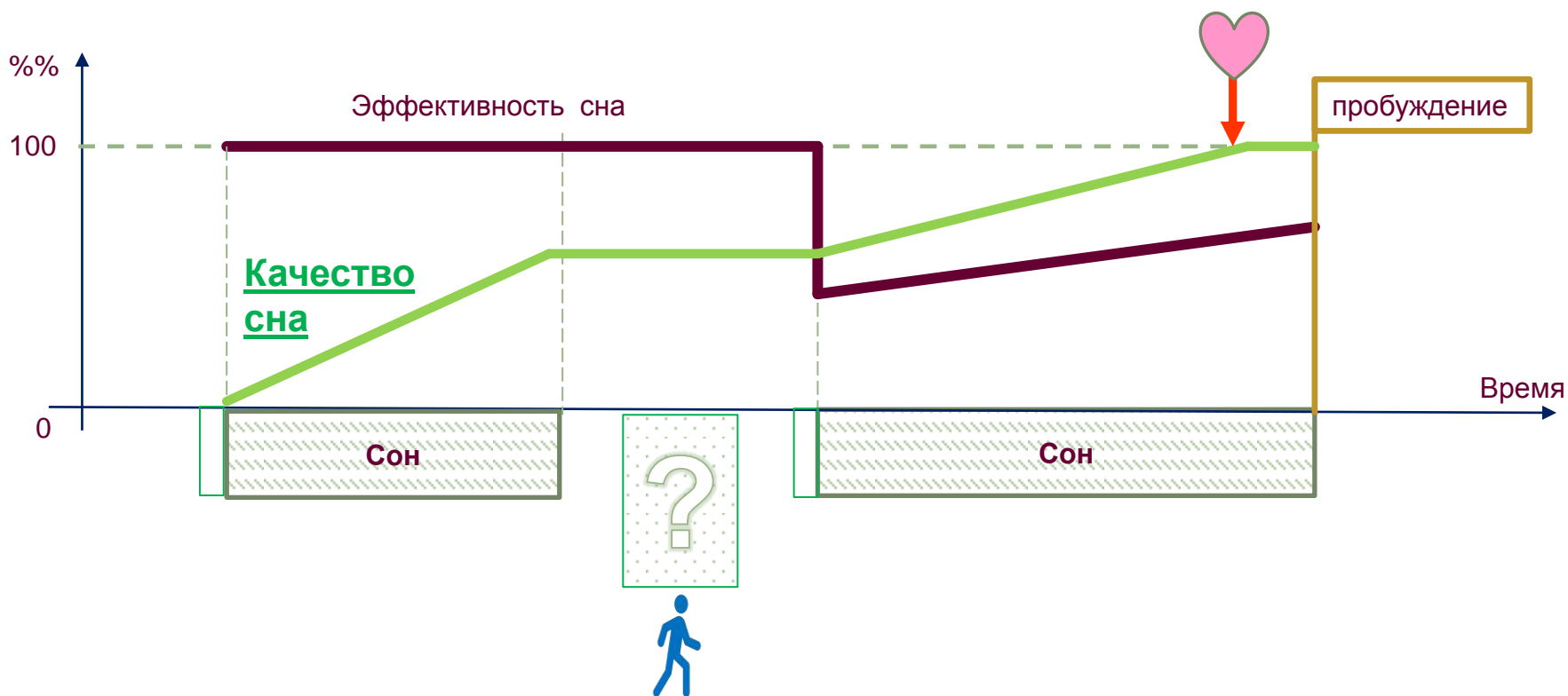
TRIZfest 2017

September 14-16, 2017. Krakow, Poland

- Suggestion of Method of Discovering Innovative Ideas
- Through Convergence of **TRIZ and Big Data Solution**
- Ji-Young Kim, Hyung-Seok Yeo, Jun-Young Lee
- (Samsung Electronics, South Korea)

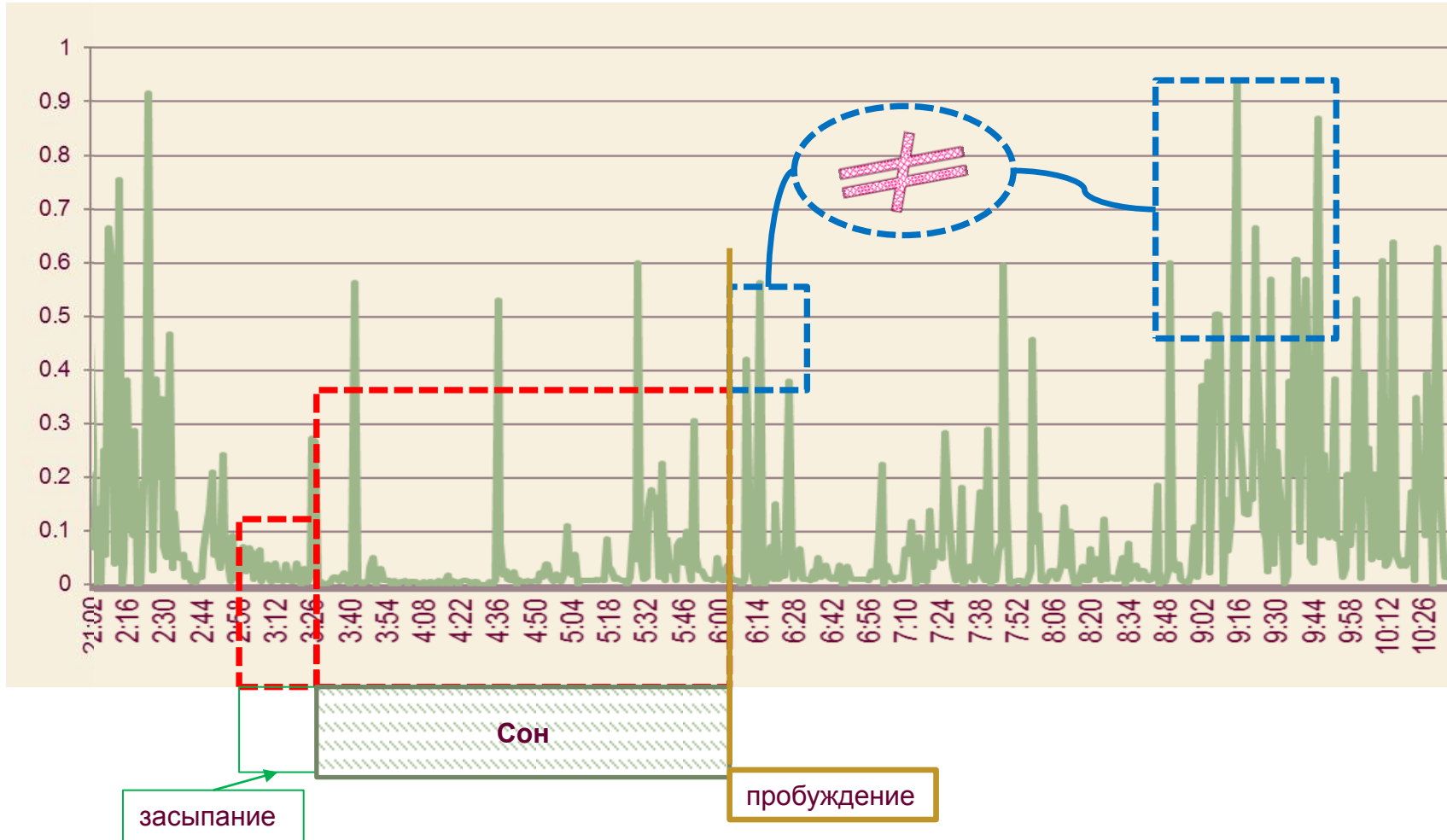


**Эффективность сна** –  
 это доля времени, когда вы действительно спите - по отношению к тому, сколько проводите в постели.



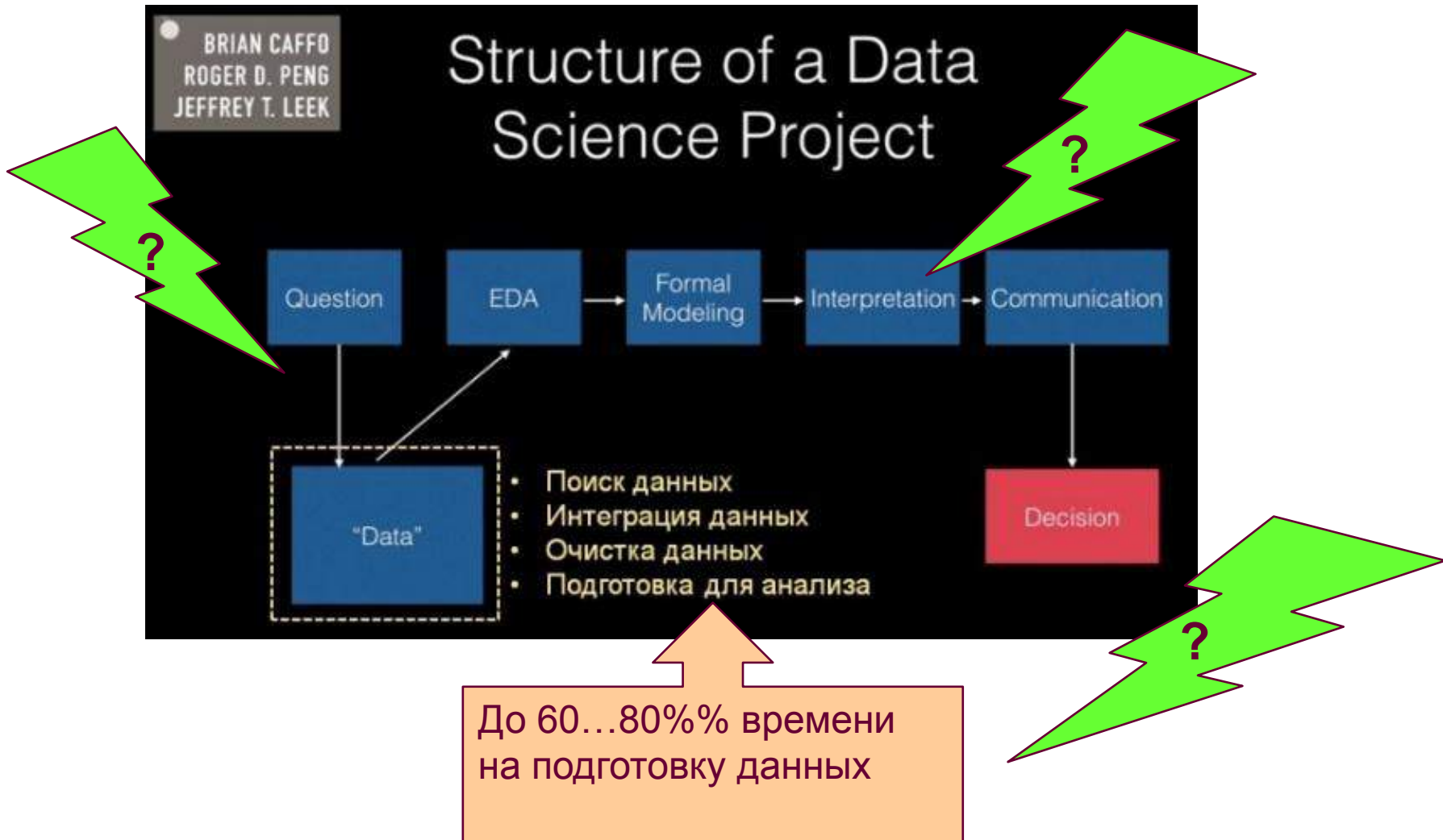
➤ Качество сна вместо эффективности сна. → следующий шаг – будить по достижению заданного качества сна

# Мониторинг сна по движениям кисти - в соответствии с функциональной моделью

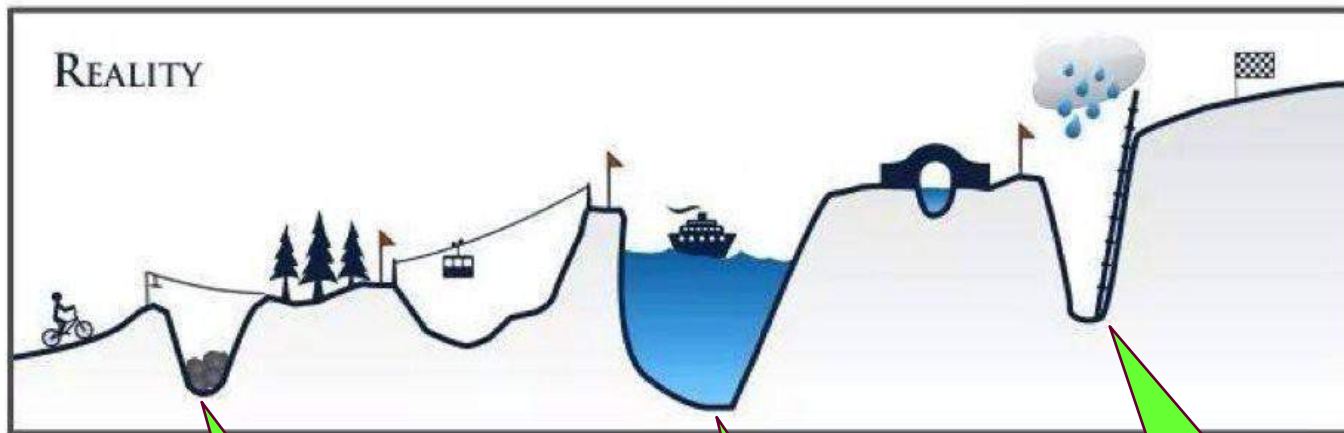
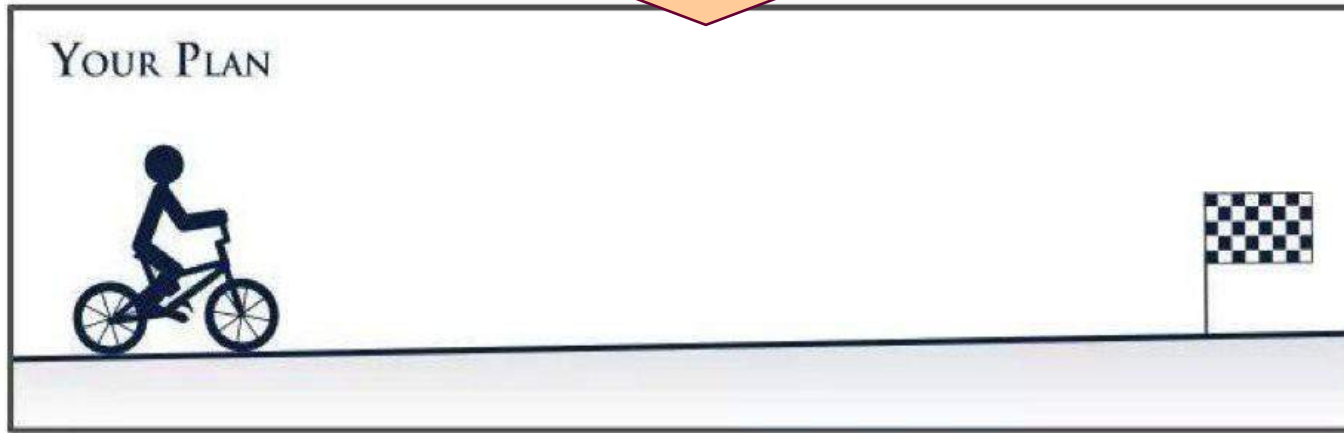


## Догадки про инсайты:

*«хорошо бы, хорошо бы нам поймать моржа большого.»*



# Обработка данных

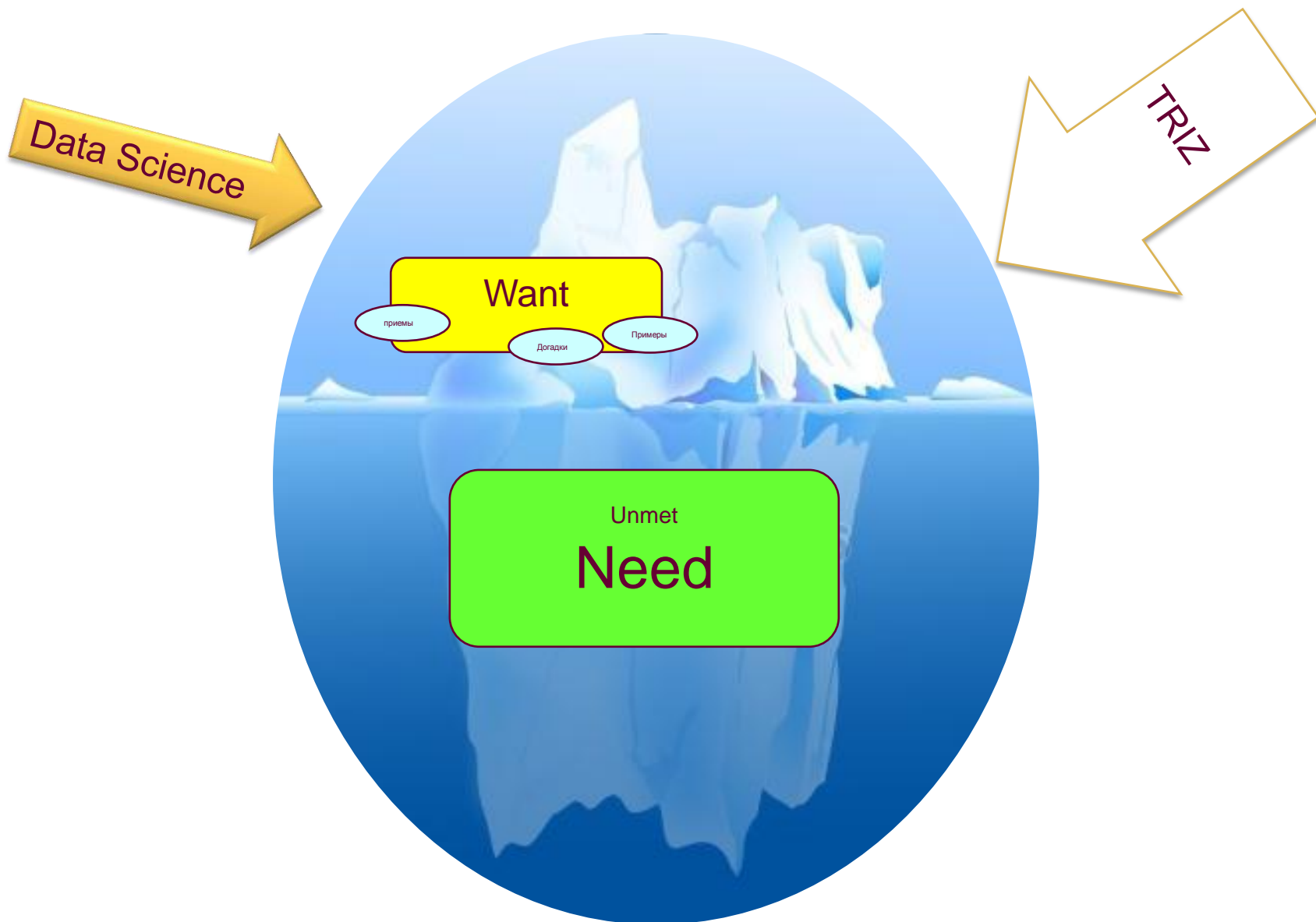




## Feature selection / extraction / engineering / discovery

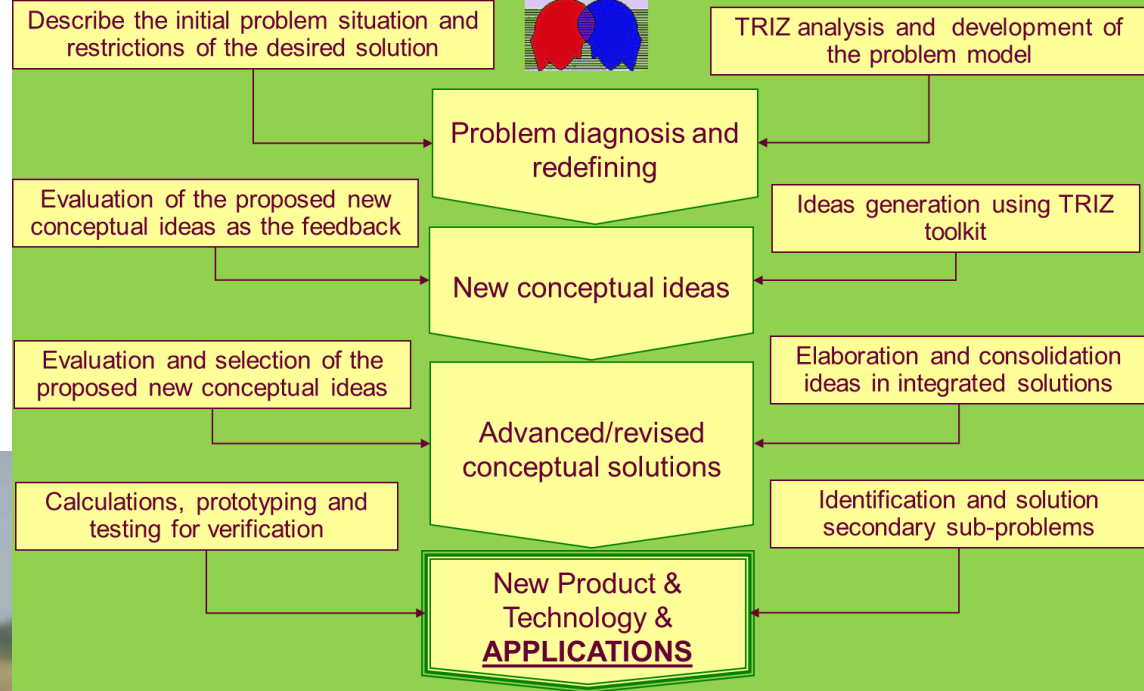


# Подведём итоги...пока они не подвели нас.

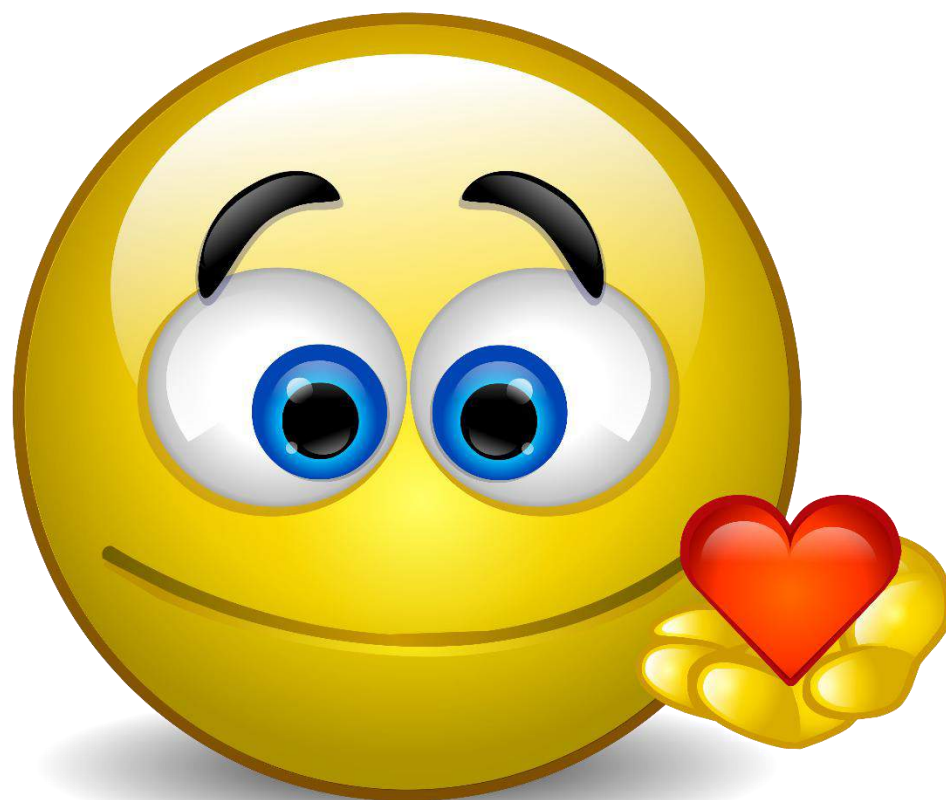


# Кáмо грядéши ?

## How collaborate **R&D Project** Team and TRIZ Team ?

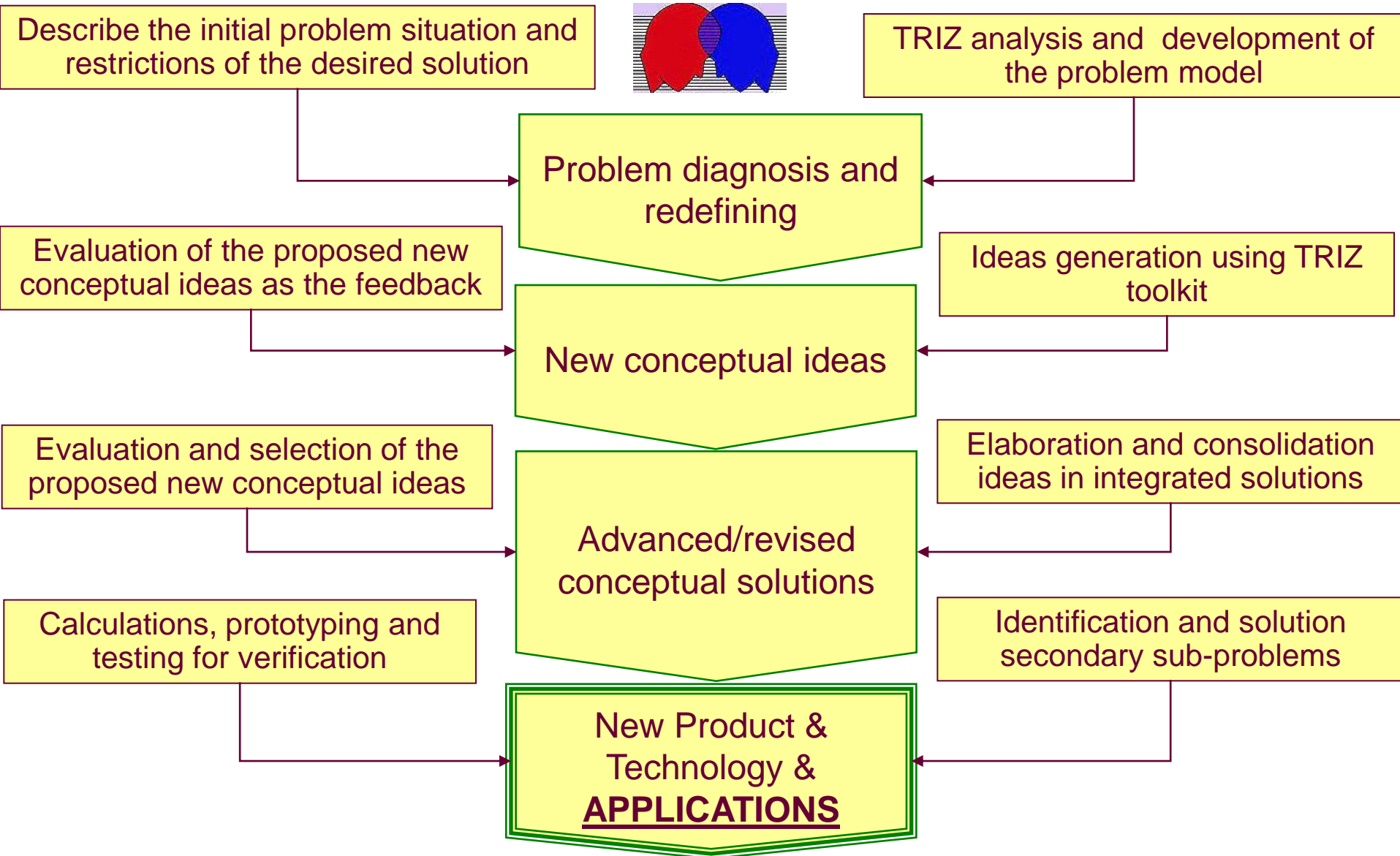


**Спасибо за внимание !**



**backup**

# How collaborate **R&D Project** Team and TRIZ Team ?



можно переносится эффект систем нежелательный инструментов книге модель нестандартные решения человека развивают система эффекты техника технике психологические оценка инструмент противоречия человеком системам положительный создать Г.С.

**ТРИЗ** законмерности наработанные конкретной стандартные системы приемы устранения противоречие деятельности задача-аналог

ЗРТС РТВ поиск сути Крылья области создаваемых средств Конфликт Икара готовых

разрешенные стандарты технологии мышление инструменты прогнозирования Икара факторы Икара

Альтшуллер переноса конфликт Методы развтия функция успешного

TRTL фонд АРИЗ отражают конфликт Методы

**задачи**

# Data Science Is Multidisciplinary

By Brendan Tierney, 2012

