Discovery on Purpose? — Paradigm Theory from the Perspective of TRIZ

Sometimes, we lose perspective because of our specialisations and get caught up in problems like flies in fly bottles. The goal of ARIZ* is — to use the words of the logician Ludwig Wittgenstein — “to show the fly the way out of the fly bottle.”

* Algorithm for Inventive Problem Solving (according to Genrich Altshuller)
“What the nature of that final stage is — how an individual invents (or finds he has invented) a new way of giving order to data now all assembled — must here remain inscrutable and may be permanently so.”

Thomas Kuhn (1970): The Structure of Scientific Revolutions

Really?
Technical Systems

I am not warm enough

I am warm enough

System Level

Super-System Level

Need

Element$_1$
Element$_2$
Element$_n$

System

Primary Function

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Explanatory Systems

Cannot explain  Can explain

Primary Function

System

Element_1  Element_2  Element_n

Fixed stars
Moving stars (Vagabonds)

Cannot explain motion of vagabonds
Can explain motion of vagabonds

Ptolemaic (geocentric) model

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Before we can start with ARIZ-85C*

Root cause of the problem already known?

No | Yes

Root Cause Analysis or Root Conflict Analysis

For a refined version of Root Conflict Analysis see here

* Algorithm for Inventive Problem Solving (see Fey V, Rivin EI (2005) Innovation on demand, Cambridge University Press, 82-111)
Step 1: The system and its problems

Primary Function

Primary Sub-Systems

Useful Contributions

Malfunctioning

Secondary Sub-Systems

External Elements

Statement of Dilemmas (Tradeoff)

System Conflict 1
System works but has problematic effects

System Conflict 2
The problematic effects are eliminated/eased but at cost of other positive effects

Explain the motion of the vagabonds
Explain vagabonds movement around the Earth with varying speed and direction
Predictions are not fully accurate

Accurate matching of observations
Simplicity

Accurate matching of observations
Simplicity
System Conflict 3
System without this sub-system (and its positive function)

Step 2: Define the task

Malfunctioning

Path A

Secondary Sub-System

due to

or

Primary Sub-System

Elimination of this secondary sub-system

Complicatedness

Periodic Revolution

Vagabond

Epic Cycle

Backwards Movement

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Step 2: Define the task

Malfuctioning

Path A

Secondary Sub-System

due to

Primary Sub-System

Elimination of this secondary sub-system

System Conflict 3

System without this sub-system (and its positive function)

Mini-Problem

Find a resource that fulfills the function of the eliminated sub-system without negative effects

Large Circle

Vagabond

Explains

Periodic Revolution

Backwards Movement

Explain periodic revolutions

Explain Backwards movement

without:

Simplicity

Explain Backwards movement
Step 3: Resources

Resources around the system

Resources in the system

Resources in the conflict domain

Step 4: Solution Concepts

Resources $R_1, \ldots, R_n$

Select a resource

Solution Idea?

Application of separation principles

Which properties $mP$ and $not-mP$ must the parts of the resource have to work as ideal solution?

*Seen from the sub-system perspective, the Earth is in the centre (the centre of observations), but seen from the perspective of the overall system, the Earth is not in the centre.
Johannes Kepler was convinced of the Copernican model (because of its simplicity) but he wanted it to be fully accurate (at this time, the geo-centric model of Tyche Brahe was much more accurate than the Copernican).
Not not thank you very much!

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