

## 6 Reinventing: TRIZ-Modeling the Invention Process

Extracting and Reinventing, based on the Meta-Algorithm of Inventing, is a modern "TRIZ-tomograph" of inventive thinking.

It works like a "time machine": reinventing allows us to explore creative thinking of any inventor from any time and era!!

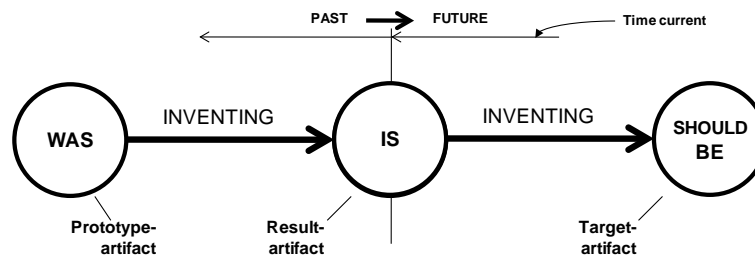
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### 6.1 Reinventing

Let us assume that we are studying a certain artifact – the product (result) of an invention. This product-artifact is in the state "is", i.e. already exists (fig. 6.1). It is matched to a certain prototype-artifact – the predecessor of the product-artifact in time. Both artifacts are vessels containing the experiences acquired in the course of their creation: technical, creative, psychological (motivational, emotional).



**fig. 6.1.** Inventions in the Course of Time

The question is this: *How do you learn to invent?*

How to you create a new target artifact? Can you use previous inventing experiences? If yes, how do you do that?

The answers to these questions are provided by the technology of reinventing developed by the author.

We need to organize – and then use on an ongoing basis – the "training–application" cycle shown in fig. 6.2. In that cycle, each new invention, together with previously created artifacts, becomes the object of analysis and the material for subsequent teaching.

<sup>110</sup> Association of Inventor Clubs created in Germany earlier within the framework of the INSTI Program (*Innovationsstimulierung* – State Program for the Support of Innovative Movement in Germany; see [www.insti.de](http://www.insti.de) and [www.erfinderclubs.de](http://www.erfinderclubs.de)); the program's successor was SIGNO – Schutz von Ideen für die gewerbliche Nutzung (Protection of Ideas for Industrial Utilization)

<sup>111</sup> [www.deutsches-museum.de](http://www.deutsches-museum.de)

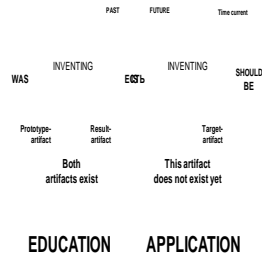


fig. 6.2. Training–Application Cycle in the Course of Time

This is where we will need the Meta-Algorithm of Invention (MAI) T-R-I-Z discussed in section 3.1 *Algorithms of Inventive Creativity*.

Reinventing is the repetition (modeling, reproduction) of the process of known problems on the basis of the format and the schema of MAI by using the methods and models of TRIZ.

**Reinventing – fundamental teaching method in Modern TRIZ.**

When reinventing beginners are studying problems with known solutions which are illustrated in the MAI format in order to understand how these problems would have been solved on the basis of TRIZ and how in the future similar problems could be solved by using both, MAI as well as TRIZ.

<b>Definition "Reinventing"</b>	<b>Reinventing</b> – modeling (reconstruction, reproduction, renewal) of the invention process.
Addition 1	<b>TRIZ-Reinventing</b> – modeling of the invention process on the basis of TRIZ models.
Addition 2	The initial reinventing has the first goal to allow students to <i>quickly and correctly acquire</i> the algorithm of inventive problems solving in the format of MAI T-R-I-Z.
Addition 3	The second and supreme mission of reinventing is to reliably prepare students for an autonomous working on <i>any new practical problem</i> .

MAI is only a general frame and a general navigator for inventive problem solving and it becomes a practical instrument only in connection with models and methods of TRIZ which equip the stages of MAI and thereby turn it into a certain variant of ARIZ – Algorithm of Inventive Problem Solving.

The content of reinventing is the reconstruction and description of all stages of an invention's creation with involvement of models and recommendations of TRIZ for each stage.

The complete reinventing process, as presented in its aggregated form in fig. 6.3 and 6.5, consists of two stages: the preliminary stage – *extracting*, and the main stage – *reinventing* on the basis of MAI T-R-I-Z.

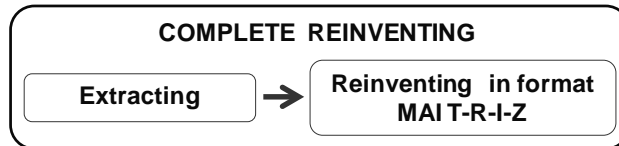


fig. 6.3. Illustration to the Definition of Reinventing

We already know that when we study a product-artifact of interest we, first and foremost, select a matching prototype-artifact, and then perform two extracting procedures:

- 1) **Extracting-1** – to identify the transformation models objectively realized in the product-artifact vis-à-vis the prototype-artifact;
- 2) **Extracting-2** – to identify the contradictions objectively eliminated in the product-artifact vis-à-vis the prototype-artifact. In other words, we are talking about contradictions that were PRESENT in the prototype-artifact, but are ABSENT in the product-artifact.

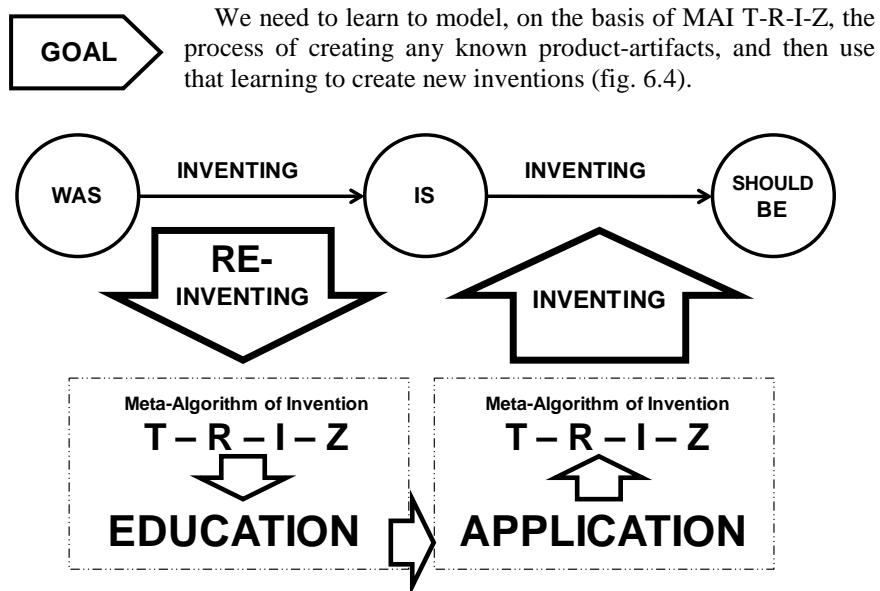


fig. 6.4. "Reinventing" on the basis of MAI T-R-I-Z in the "education – application" cycle

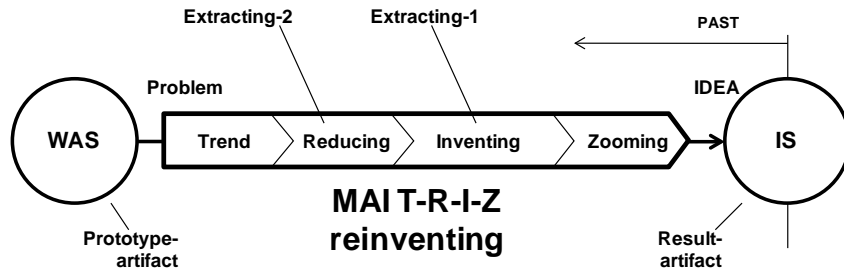


fig. 6.5. Extracting procedures for Reinventing

**Example 6.1. Over-the-Table Exhaust Fan.**



In South Korea there are many extremely popular restaurants where you cook yourselves using various "materials" ordered from your waiter (fig. 6.6, a). For example, you can grill meat on hot coals (fig. 6.6, b) right on your table! To remove smoke, each table is equipped with an overhanging exhaust pipe (fig. 6.7, a) which can be easily lowered down to the meat grill.

The switch and the draft control are mounted on the pipe (fig. 6.7, b, in the black oval).

fig. 6.6. The Korean "Self-Servicing" Way

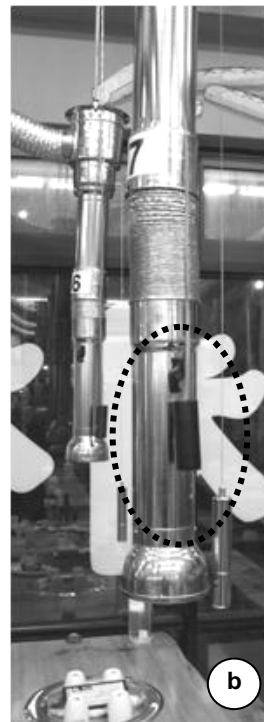


fig. 6.7. An Impressive Exhaust Ventilation System!

Now, that's an interesting invention! Let us "invent" it again!

**Preliminary Modeling: Extracting.**

Extracting-1 yields the following models (fig. 6.8):

+	<b>02</b>	Preliminary action	The pipe intake can be fixed at any height above the table.
++	<b>05</b>	Separation	Smoke is removed from the grill zone.
+	<b>07</b>	Dynamization	The pipe can be moved up and down using a special cable (preinstalled feature). The pipe is corrugated in the middle, and when you fix it above the table its length can vary quite significantly.
++	<b>12</b>	Local property	The pipe can be fixed at the required level when in operation, and raised high above the table when idle. Switches and regulators are placed on the pipe rather conveniently.
++	<b>14</b>	Use of pneumatic and hydraulic constructions	The exhaust fan is working as a pneumatic pump extracting the air from above the grill.
++	<b>18</b>	Mediator	The pipe (and the entire system) act as the mediator between the table and the space outside the restaurant.
+	<b>19</b>	Transition into another dimension	The pipe is hanging from above – saving space.
+	<b>35</b>	Unite	All pipes are joined to larger-diameter pipes which are also connected into a single system.

**fig. 6.8.** Extracting-1 Results for the "Over-the-Table Exhaust Fan" Artifact

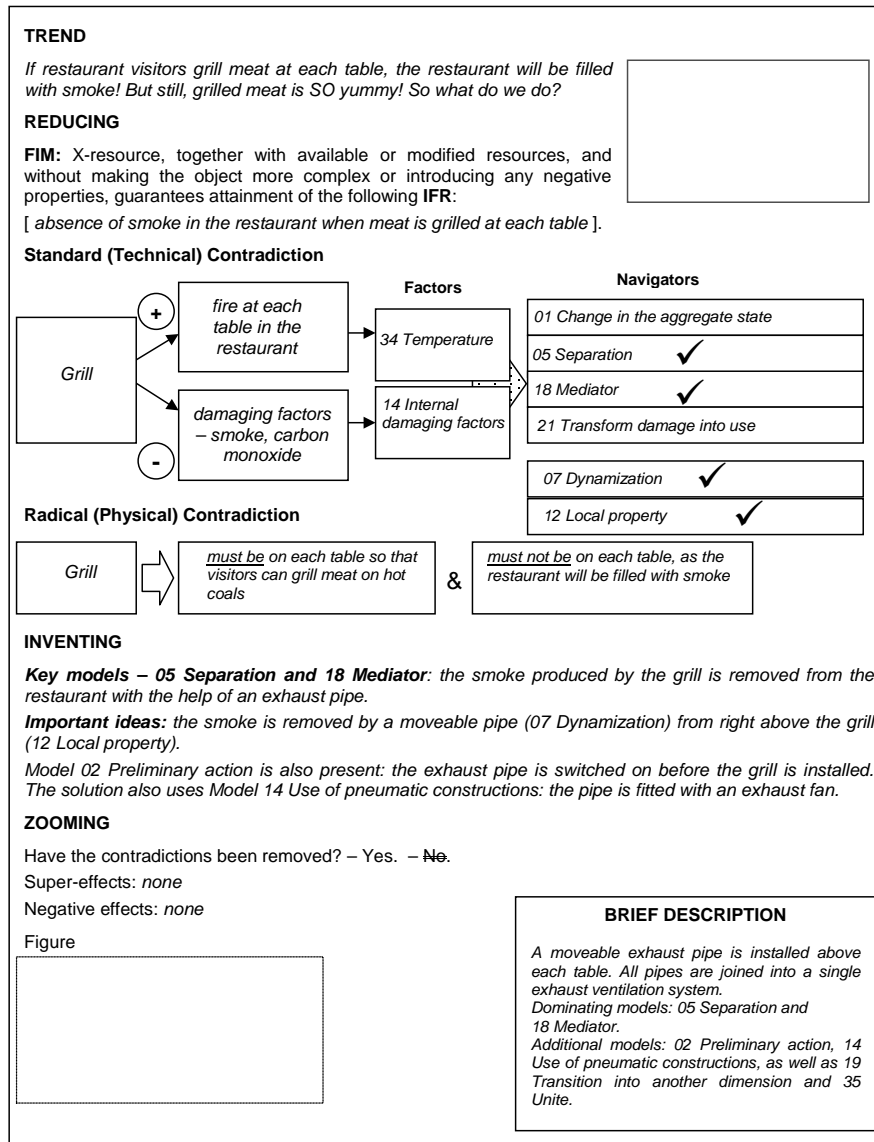
As a result of Extracting-2, let us write down one standard contradiction and one radical contradiction (fig. 6.9).

++	<b>02</b>	Preliminary action	<b>Standard Contradiction:</b> It would be nice to grill meat right on the table, but then the restaurant would be filled with smoke.
++	<b>05</b>	Separation	
++	<b>07</b>	Dynamization	<b>Radical Contradiction:</b> The smoke must be "far" from the table (outside of the restaurant) to permit normal breathing, and the smoke must be "close" to the table (inside the restaurant) as it takes a long time to be cleared by natural ventilation.
++	<b>12</b>	Local property	
++	<b>18</b>	Mediator	

**fig. 6.9.** Extracting-2 for the "Over-the-Table Exhaust Fan" Artifact

**Main Modeling: Reinventing.**

Let us provide a brief description of one of the MAI T-R-I-Z reinventing variants (fig. 6.10).



**fig. 6.10.** MAI T-R-I-Z Reinventing for the "Over-the-Table Exhaust Fan" Artifact

Here we have added descriptions for the Trend and Zooming stages, and provided more detailed description of the Reducing and Inventing stages. At the Reducing stage we have illustrated formal contradiction modeling and selection of transformation models recommended by the A-matrix – or introduced by extracting (if the A-matrix offers no models to resolve the relevant formal contradiction). At the Inventing stage we have shown application (interpretation) of transformation models taken from the  $A_S$ -catalog to resolve the problem under study.

**NOTE**

An experienced TRIZ-modeler can perform reinventing for relatively simple artifacts even easier and faster by completing the extracting exercise in the course of main reinventing. In any case, reinventing is based on extracting applied transformations from the product-artifact, and extracting contradictions from the prototype-artifact.

**Example 6.2. Carousel Table.**

In China tables (fig. 6.11) are often fitted with carousel-like additional "tabletops" – they may be in the form of a ring (a) or a solid disc (b, c) made of wood (a) or glass (b, c), large (a, c) or relatively small (b). On this "second floor", they place dishes with food, and anyone can turn the disc and easily take whatever they need. The disc may also hold a flower display (c) which can then be gradually examined from all sides.



**fig. 6.11.** Several Variants of the Chinese "Carousel Table".

When sitting at such table (well, at any other table, for that matter!), all you need to do is be attentive and polite – and:

- 1) before starting to rotate the disc make sure that no-one else is doing it at that moment in time – or loading food off the table;
- 2) considerably help others to rotate the disc which often displays noticeable inertia due to the quantity and weight of the dishes.

This reinventing looks like it was made without extracting. But take a closer look at the description (fig. 6.12), and you will see that extracting is always present in any reinventing – whether directly or indirectly (like in this example) – and that no reinventing is in fact possible without extracting!

If now you perform the extracting by yourselves, you will easily find several other useful models in this artifact.

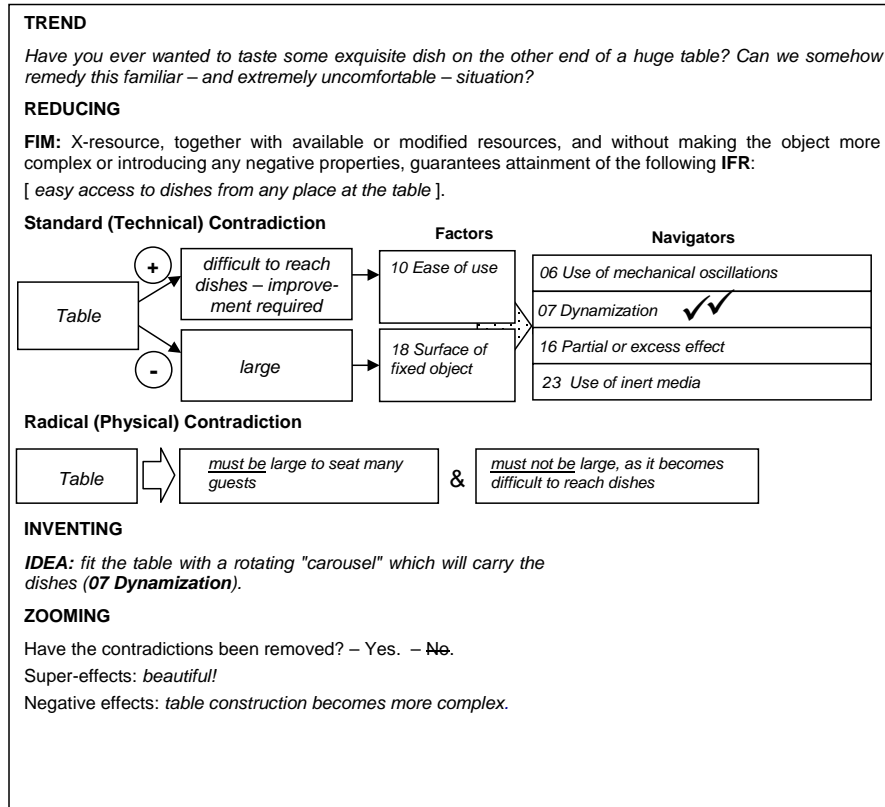


fig. 6.12. "Carousel Table" reinventing

## 6.2 Prototype-artifact and Product-artifact

So, let us assume that we are studying a certain artifact – the fruit (product) of an invention.

### ATTENTION: Critically Important Methodological Recommendations

When doing extracting and reinventing, it is absolutely necessary to remember the following (fig. 6.13):

- 1) transformation models are formulated for the **Product-artifact** in comparison with the prototype-artifact;
- 2) contradictions are formulated for the **Prototype-artifact** – in the product-artifact, the initial contradictions are already removed;
- 3) MAI T-R-I-Z stages Trend and Reducing are "linked" to the prototype, while stages Inventing and Zooming are "linked" to the product.