ARIZ-85C

Template for
working with Problems using the
Algorithm of Inventive Problem Solving (ARIZ)
of the
TRIZ Consulting Group GmbH

This version of the template was based on the book “Tools of Classical TRIZ” as well as on translations of the ARIZ-85C by Simon Litvin and Valeri Souchkov / Dimittry Kucharavy.

1 Analyzing the Problem

1.1 Formulate the Mini-Problem

There is an engineering system for (indicate the main function preferably in the form “Tool – Action – Product” like in function analysis)

That consists of (list major parts)

Engineering contradiction 1 (EC-1; IF … THEN … BUT; Replace Hamlet contradiction by e.g. big and small if possible):

IF THEN BUT

Engineering contradiction 2 (EC-2; Invert EC-1 without thinking (= Alternative EC), then check validity):

IF THEN BUT

It is necessary to (<THEN EC-1> while <THEN EC-2>)

with minimal changes to the system.

1.2 Define the conflicting elements

To define the tool (function carrier of main function) and the product (equals target (function analysis), the target is the object of the main function)

Product:		
Tool:		State 1 *(property, feature, parameter of the tool (e.g. big, long, heavy))*
		State 2 *(property, feature, parameter of the tool)*

1.3 Build Graphic Models for the Engineering Contradictions

Graphic representation of EC-1 and EC-2 (formulate as valid function, draw as SuField)

EC-1

EC-2

1.4 Select a Graphic Model for Further Analysis

To choose a basic contradiction and its graphic interpretation. It is a situation where the main function is delivered better.

Basic engineering contradiction *(Repeat the chosen EC from 1.1)*:

IF THEN BUT

(Repeat from 1.2)

Product:	
Tool:	

Its graphic interpretation *(Repeat from 1.3)*:

1.5 Intensify the Conflict

The aggravated basic contradiction (take an extreme state of 1.2 in IF, formulate/repeat the rest of the basic EC in the form IF… THEN… BUT…)

1.6 Describe the Problem Model

There are (to indicate the tool and the product from step 1.4 under the condition of step 1.5 as a summary of part 1, copy from 1.5)

It is necessary to introduce an X-component that (enables the tool to deliver the main function without any harmful consequences – job description of mister X; preserves <THEN 1.6> and eliminates <BUT 1.6>)

with minimal changes to the system.

(Annotation: Part 2 and 3 are searching for mister X.)

1.7 Apply the System of Standard Solutions

Consider solving the Problem Model using the System of Standard Solutions. If it does not solve the problem, go to Part 2.

SuField-Model of the Problem		SuField-Model of the Solution
		

2 Analyzing the problem model

2.1 Define the Operational Zone (OZ)

Define the operating zone (OZ) (the space where there is the conflict from 1.4)

Define the operating zone (OZ) (Question: Where is operation/action 1 and 2 happening?; Where do we <THEN 1.6>?, Where do we <BUT 1.6>?):

The operating zone (OZ) is:

Drawings:

Is the operating zone the same? YES / NO

2.2 Define the Operational Time (OT)

Define the operating time (OT) (the time where there is the conflict from 1.4):

Define the operating time (OT) (Question: When is the operation/action 1 and 2 happening?; When do we <THEN 1.6>? When do we <BUT 1.6>?):

The operating time (OT) is:

Is the operating time the same? YES / NO

2.3 Define the Substance-Field Resources (SFR)

Analyse resources of substances and fields (SFR)
SFR of the system in the operating space (OS has best resources, because already in place):
(Here parameters can be a resource: e.g. shape, length, electrical resistance)

	Substances	Parameters	Fields
Tool			
Product			

SFR of the environment in the operating space
specific environment for the problem

Substances	Parameters	Fields

General ambient resources

Substances	Parameters	Fields

SFR of the supersystems
wastes, by-product, secondary resources

Substances	Parameters	Fields

3 Ideal final result and physical conflict

Goal: to define the Ideal Final Result (IFR) of the solution and a physical conflict that does not allow to reach IFR

3.1 Formulate the IFR-1

Define IFR-1 using the following pattern *(Refers to 1.6, second box)*:

X-component itself eliminates the <harmful action> *(<BUT 1.6>)* and allows/preserves to <deliver the main function> *(<THEN 1.6>)* of the system in the operating space (specify) during the operating time (specify) without making the system more complex and without any harmful consequences. *(Refers to 2.2, 2.1)*

3.2 Intensify the definition of IFR-1

Intensify the IFR by introducing limitations: it is NOT allowed to use foreign, new fields and substances
use SFR (use SFR in your preferred order)

Substitute X-component for all the SFR defined at step 2.3

1.
2.
3.

3.3 Identify the Physical Contradiction for the Macro-Level

Define the physical contradictions for all ressources on macrolevel

Formulate the Physical Contradiction for Macro-Level according to the following template:

The Operational Zone during the Operational Time should be (indicate physical macro-state, for example “hot” – MS1) in order to perform (indicate one of the conflicting actions), and should be (indicate the opposite physical macro-state, for example “cold” – MS2) to perform (indicate another conflicting action or requirement).

The parameter (specify) of the resource (specify) should be value 1 (specify) to eliminate the harmful action (specify) and/or value 2 (specify) to provide a positive effect (specify).

Resource: _____

Resource parameter: _____ (RP)

(RP) _____ should be _____(MS1) for _____
and
(RP) _____ should be _____(MS2) for _____.

Resource: _____

Resource parameter: _____ (RP)

(RP) _____ should be _____(MS1) for _____
and
(RP) _____ should be _____(MS2) for _____.

Resource: _____

Resource parameter: _____ (RP)

(RP) _____ should be _____(MS1) for _____
and
(RP) _____ should be _____(MS2) for _____.

(Create Physical Contradiction:
Take statement of 3.2 (e.g. “design of the wall”)
Find possible solution (design => hole in the wall)
Find parameters for possible solution (hole: large or small)
1st case: No requirement for the resource or requirement does not make sense
=> drop physical contradiction
2nd case: No justification possible => solution
3rd case: Valid Physical Contradiction => solve it =>solution)

3.4 Identify the Physical Contradiction for the Micro-Level

Formulate the Physical Contradiction for the Micro-level according to the following template:

The particles of a substance (indicate their physical state or action) should be in the Operational Zone in order to provide (indicate the required macro-state according to step 3.3) and should not be there (or should have the opposite state or action) in order to provide (indicate another macro-state according to step 3.3).

Macro-state 1: _____ Macro-state 2: _____ (Particles) _____ should be _____ for _____(MS1) and (Particles) _____ should be_____ for _____(MS2).
Macro-state 1: _____ Macro-state 2: _____ (Particles) _____ should be _____ for _____(MS1) and (Particles) _____ should be_____ for _____(MS2).
Macro-state 1: _____ Macro-state 2: _____ (Particles) _____ should be _____ for _____(MS1) and (Particles) _____ should be_____ for _____(MS2).

3.5 Formulate the Ideal Final Result (IFR-2)

Formulate the Ideal Final Result (IFR-2) according to the following template:

The Operational Zone (indicate) during the Operational Time (indicate) should, on it own, provide (indicate the opposite macro- or micro-state).

3.6 Apply the System of Standard Solutions to resolve the Physical Contradiction

Consider solving the new physical problem using the system of standard solutions. If after doing this the problem is still unsolved, go to Part 4.