

# Semantic Web Modelling of TRIZ System Evolution Concepts

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## A Short Overview

- ▶ Nikolay Shpakovsky (2010). Tree of Technology Evolution (in Russian, English translation available).
- ▶ Alex Lyubomirsky, Simon Litvin, Sergei Ikovenko et al. (2018). Trends of Engineering System Evolution (TESE). TRIZ Consulting Group. ISBN 9783000598463.
- ▶ Tom Stempel (2021). Code of the RDF Modelling of Evolution Trees. Directory Ontologies/EvolutionTrees in the github repo  
<https://github.com/wumm-project/RDF-Data>.
- ▶ Tom Stempel (2021). A Proposal for Modelling TRIZ System Evolution Concepts. <https://wumm-project.github.io/Texts/WOP-EvolutionTrees.pdf>.
- ▶ The WUMM Project. <https://wumm-project.github.io/>.
- ▶ The TRIZ Ontology Project.  
<https://wumm-project.github.io/Ontology>.

# Evolution of Technical Systems

- ▶ (Altshuller 1969) The Invention Algorithm.
- ▶ (Altshuller 1979) Creativity as an Exact Science.
- ▶ (Altshuller 1980) Wings for Icarus.
- ▶ (Goldovski 1983) The System of Laws of Construction and Development of Technical Systems

(Altshuller 1979)

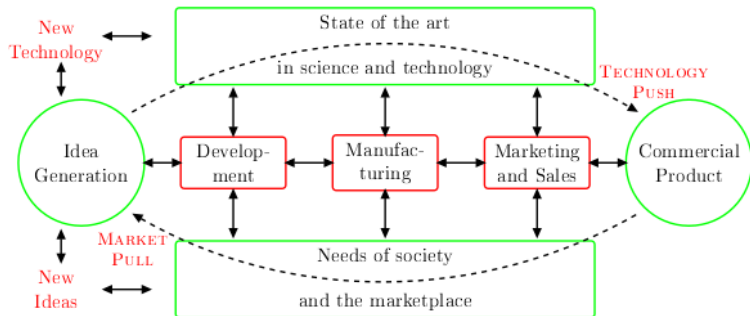
6. From simple to complex procedures
7. Strategy of inventing: Controlling the task setting
8. The science of inventing

# Evolution of Technical Systems

(Altshuller 1979, chapter 7)

- 7.1. The "lifeline" of a technical system
- 7.2. Goal – Task – Specification of the task
- 7.3. Laws of development
- 7.4. Standards for solving inventive tasks
- 7.5. Application of the standards

# Evolution of Technical Systems



Hans-Gert Gräbe. TRIZ and Systemic Transitions.

Submitted in June 2020 to TRIZ Review.

<https://hg-graebe.de/EigeneTexte/sys-20-en.pdf>

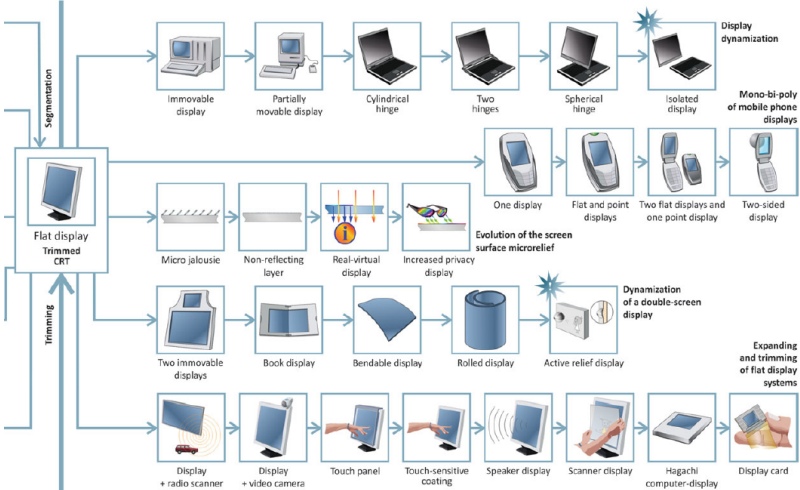
# The Dilemma of Conceptualisation

Which concepts are required to describe the Evolution of a Technical System as e.g. a car?

(TESE 2018) contains many examples of car related inventions, but how do they relate to Car Evolution?

# Evolution Trees

Evolution tree of display. Part 4



# The Evolution Tree Ontology

Ten `tc:BasicEvolutionPattern` according to (Shpakovski 2010)

- ▶ Mono-Bi-Poly
- ▶ Trimming
- ▶ Expanding-trimming
- ▶ Segmentation
- ▶ Geometrical evolution
- ▶ Object structure evolution
- ▶ Evolution of surface properties
- ▶ Dynamization
- ▶ Increasing the controllability
- ▶ Increasing the coordination of the elements



# The Evolution Tree Ontology

```
tc:SegmentationPattern a skos:Concept ;
  od:subConceptOf tc:BasicEvolutionPattern ;
  od:hasSubConcept tc:Monolith, tc:TwoParts,
    tc:ManyParts, tc:Granules, tc:Powder, tc:Paste,
    tc:Liquid, tc:Foam, tc:Fog, tc:Gas, tc:Plasma,
    tc:Field, tc:Vacuum, tc:IdealObject ;
  skos:prefLabel "Segmenting objects and substances"@en ;
  skos:example ""Segmentation of an
    aircraft propulsion unit""@en .
```

```
tc:Liquid a skos:Concept ;
  od:subConceptOf tc:SegmentationPattern ;
  skos:prefLabel "Liquid"@en .
```

## Applying the Modelling

```
ex:TVWithLargePixels ex:decreasePixelSize
  ex:TVWithMediumPixels .
```

```
ex:decreasePixelSize a rdf:Property, skos:Concept ;
  od:usesPattern tc:SegmentationPattern ;
  skos:prefLabel "Decrease pixel size"@en ;
  skos:definition ""Decrease pixel size by segmentation
    of one big pixel in several smaller ones""@en .
```