Method for Transferring the 40 Inventive Principles to Information Technology and Software

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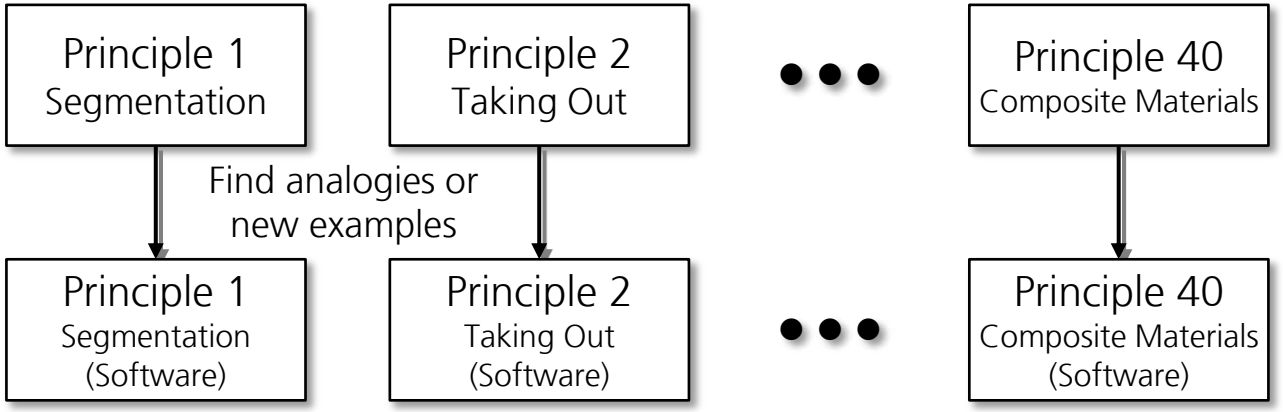
The Problem

- The 40 Inventive Principles (40 IP) were created before information technology (IT) and software grew up.
  - ➡ The 40 IP do not consider IT and software.
- In the past 15 years, IT and software became very important.
  - ➡ The 40 IP became interesting for IT and software, but…

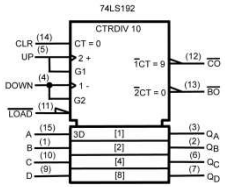


- …the 40 IP remained nearly unchanged in most cases.
  - ➡ Lateral thinking is necessary to apply the 40 IP to the IT or software problem. ➡ Results are suboptimal.

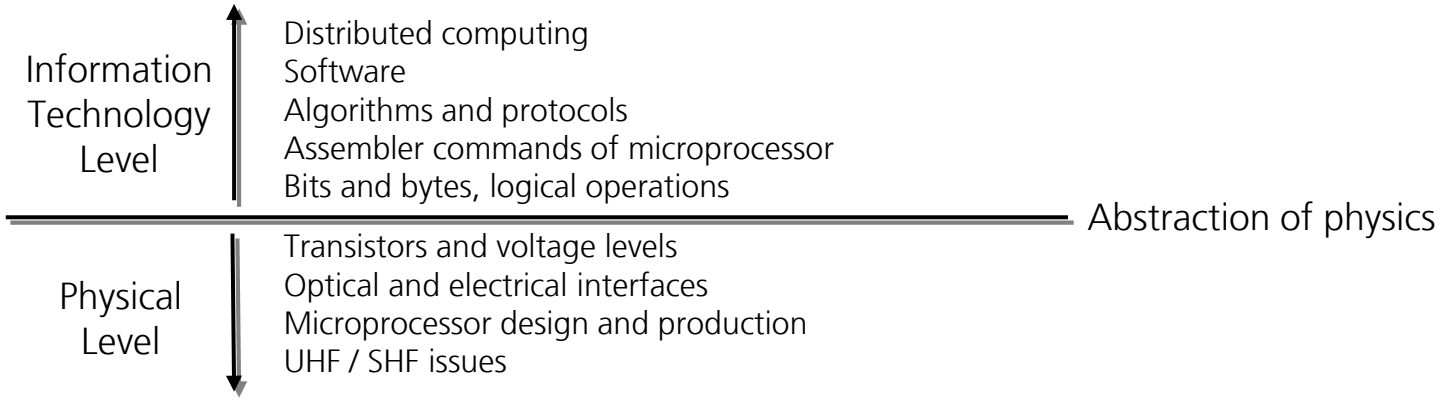
But… is Information Technology this Different?

- Physics and chemistry were "defined" by nature.
  - ➡ The rules are very complex and not known exactly.

- Information technology (IT) was defined by humans.
  - ➡ The rules are relatively simple and completely known.



- IT is explicitly separated from physics.



- Because of the differences above, the Inventive Principles for IT could be very different from the original ones – but this is not known yet.

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Characteristics of Technical Systems

- Basically, the characteristics of a technical system are

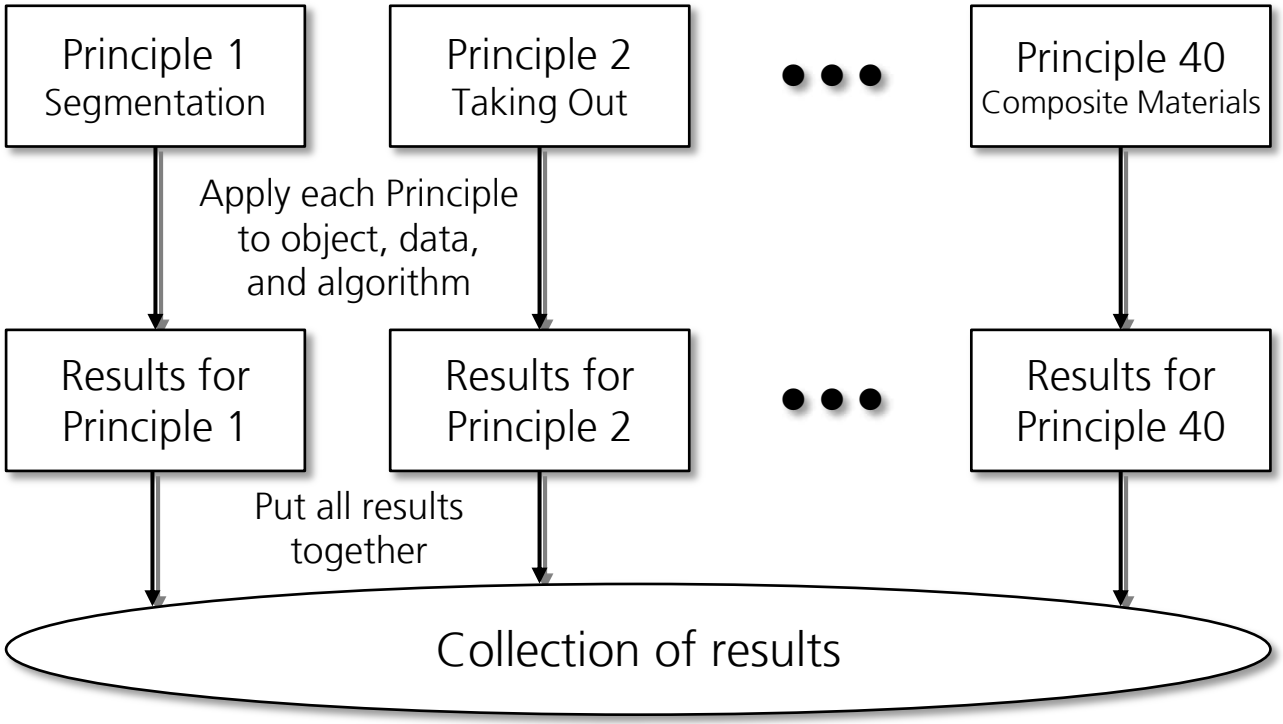
Physics and chemistry	Information technology
Any object and field	Objects – any equipment able to provide or process binary data
Characteristics and status of an object or field	Data – any information available in binary format
Interactions between objects and processes inside the system	Algorithms – any sequence of well-defined steps performed by objects using data

- Inventive Principles for information technology apply only to objects which are part of IT systems.

- Example: coffee machine
  - Old-style coffee machine – Not part of an IT system.
  - Wi-Fi enabled coffee machine – Part of an IT system.

Step 1: Use the Power of the 40 Inventive Principles

- Apply each of the 40 Inventive Principles to the characteristics of information technology.



- About 400 results were found.
- Each result found is a tiny solution model.

Example Results of Step 1

- Results of applying Inventive Principle 14 ("Spheroidality"):

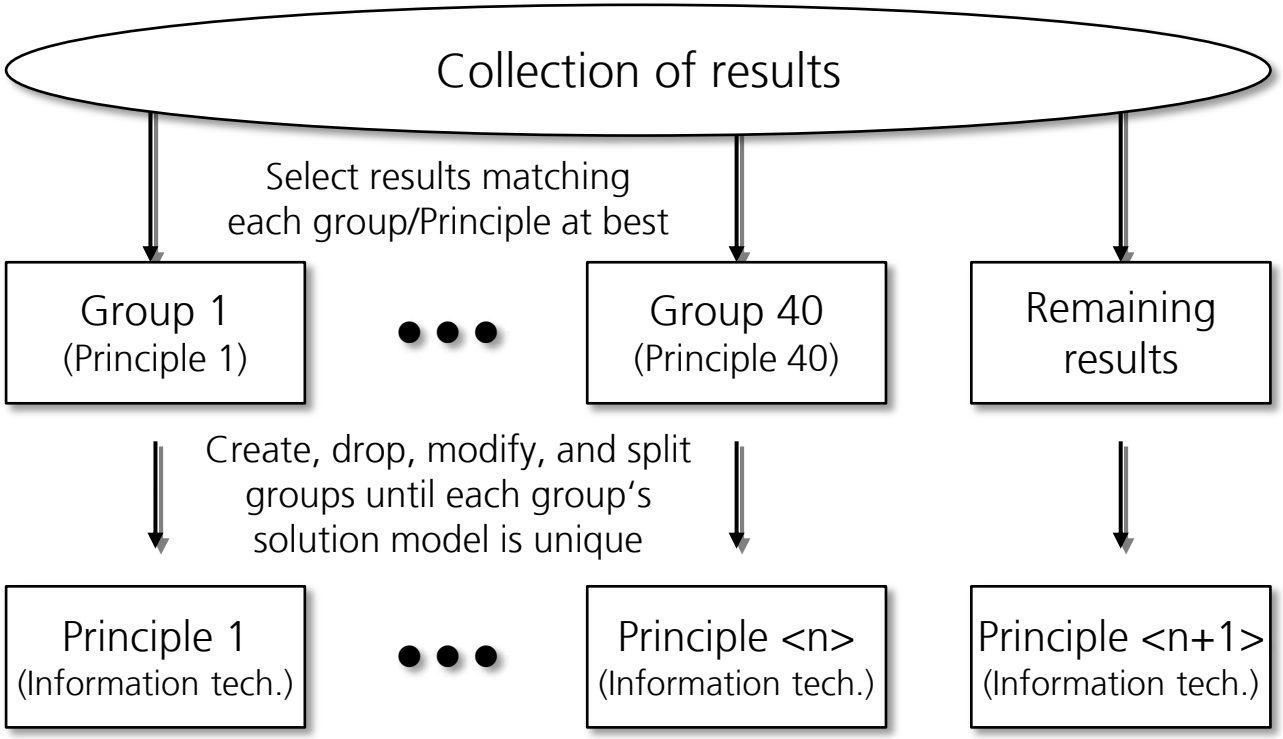
Results for "data"
Encode data non-linear, e.g. logarithmic
Introduce random access to data
Change order of data
Work using approximated data
Encode extreme values using special codes

Results for "algorithms"
Transform a linear algorithm into a non-linear one
Split an algorithm into its special cases. Handle each one separately
Execute parts of the algorithm at different speed
Introduce branches into algorithms. Further actions become different
Just process parts of the data and in random order
Change parts of the algorithm each time executed
Switch communication channels

Step 2: Group the Results found

- All results found have to be re-grouped now.

- For simplifying the work, the original 40 Inventive Principles were initially set as target groups.



Modification of the Initial Groups

- If a group gets no or few results assigned to:
  - ➡ Drop the group.
- If a group gets many results assigned to:
  - ➡ Split the group, modify both solution models.
- If a result can be assigned to more than one group:
  - ➡ Modify the solution model of the groups.
- If a result cannot be assigned to a group:
  - ➡ Keep the result, it may be a new principle.

Inventive Principles Modified or Dropped

- Inventive Principles modified considerably:

Original Inventive Principle	Description as IP of information technology
#28 Mechanics substitution	Change the connection.
#29 Pneumatics and hydraulics	Make things fuzzy.
#34 Discarding and recovering	Do it quick and dirty.
#36 Phase transitions	Analyze the changes.

- Inventive Principles dropped:

Dropped Inventive Principle
#8 Anti-weight
#14 Spheroidality – curvature
#18 Mechanical vibration
#30 Flexible shells and thin films
#31 Porous materials

Dropped Inventive Principle
#35 Parameter changes
#37 Thermal expansion
#38 Strong oxidants
#39 Inert atmosphere
#40 Composite materials

Conflicting Groups

- Examples for conflicting groups in terms of information technology:

Group	Conflicting group
#16 Partial or excessive actions	#2 Taking out
#18 Mechanical vibration	#19 Periodic action
#25 Self-service	#6 Universality
#26 Copying	#2 Taking out
#27 Cheap short-living objects	#34 Discarding and recovering
#38 Strong oxidants	#16 Partial or excessive actions
#38 Strong oxidants	#22 Blessing in disguise
#39 Inert atmosphere	#34 Discarding and recovering

Example Results of Step 2

- Assignments of results of applying Inventive Principle 14 ("Spheroidality"):

Results for "data"	Target Principle for information tech.
Encode data non-linear, e.g. logarithmic	#16 "Work more or less" (Partial or ex. act.)
Introduce random access to data	#15 "Let things change" (Dynamics)
Change order of data	#15 "Let things change" (Dynamics)
Work using approximated data	#16 "Work more or less" (Partial or ex. act.)
Encode extreme values using special codes	#14 (dropped)

Results for "algorithms"	Target Principle for information tech.
Transform a linear algorithm into a non-linear one	#12 "Minimize changes" (Equipotentiality)
Split an algorithm into its special cases. Handle each one separately	#1 "Divide up mixed things" (Segmentation)
Execute parts of the algorithm at different speed	#21 "Hide incomplete things" (Skipping)
Introduce branches into algorithms. Further actions become different	#1 "Divide up mixed things" (Segmentation)
Just process parts of the data and in random order	#15 "Let things change" (Dynamics)
Change parts of the algorithm each time executed	#23 "Close the loop" (Feedback)
Switch communication channels	#28 "Change the connection" (Mech. Sub.)

Example Principle for Information Technology

Principle #15 “Dynamics”	
Abstract:	Let things change.
Objects:	Enable objects of adding, modifying or removing functions while in use.
	Enable the system to add or remove objects at any time.
Data:	Make static data dynamic.
	Make implicit data explicit, then dynamic.
	Make static data parameters dynamic.
Algorithms:	Enable an algorithm to execute steps in a random order.
	Fit an algorithm to resources changing during runtime.
Example:	In Internet television, the video stream bandwidth is dynamically adapted to the current bandwidth of the user device. By doing so, the video quality may get worse but the video does not stop.

Summary

- Instead of doing a 1:1 transfer of the 40 IP, a more flexible method was applied.

- Original Principles were dropped and modified, matching information technology in a better way.

- The necessary lateral thinking was reduced, increasing idea count and quality.

- 30 Inventive Principles for information technology were created. Furthermore, one possibly new Principle was found: “Transmutation“.

Thank you for your kind attention!

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