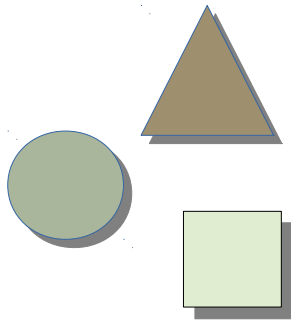# 71. Aspect-Oriented Problem Analysis, a Problem Analysis based on Relation Analysis and Matrices

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Lehrstuhl Softwaretechnologie

Fakultät Informatik

TU Dresden

15-0.1, 15.07.15

1) Variation-based Analysis

2) Aspect-Oriented Problem Analysis (AOPA)

3) Aspect-Oriented Efficiency Analysis (UCEW)

4) BSC as example

Literatur

[Rupp] Rupp, Ch. (Sophist Group): Requirements-Engineering und – Management. Hanser Verlag

[Wikipedia]

Statement Balanced Scorecard des ICV Internationaler Controller Verein: http://www.controllerverein.com/redaktion/download.php?id=76&type=file

References

▶ [deBono] Edward de Bono. de Bono's neue Denkschule. Kreativer denken, effektiver arbeiten, mehr erreichen. mvg-Verlag, München.

▶ [VanGundy-ProblemSolving] Arthur B. Van Grundy. Techniques of structured problem solving. Van Nostrand Reinhold Company, 2nd edition, 1988. The bible of problem solving techniques.

▶ [Hill] Bernd Hill. Der Methodenbaukasten - Ein Kompendium von Methoden zur Erkennung und Lösung technischer Probleme. 2. erw. u. überarb. Aufl. [Taschenbuch bei amazon]

▶ Rohrbach, Bernd: Kreativ nach Regeln – Methode 635, eine neue Technik zum Lösen von Problemen. Absatzwirtschaft 12 (1969) 73-76, Heft 19, 1. Oktober 1969.

71.1 Advanced Generation of Ideas, Alternative Analysis, and Prioritization (GAP Analysis)

- [VanGundy-ProblemSolving]
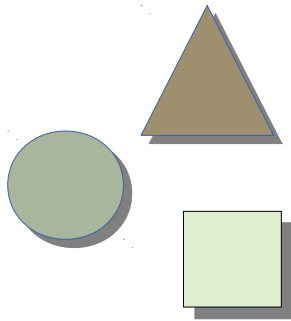
Variation and Extension Method for GAP Analysis

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▶ **Variation Method about Variability Analysis** [Hill, Zwicky]

  – In a basic solution, try to ***find variables (variation points)*** which might be changed. In specifications or designs, the variables are called *variation points*

  – Analyze their range: which values may they take?

  – Change the variables

  – Build variant solutions

▶ **Extension Method, Extensibility analysis**

  – In a basic solution, try to find *variables* which might be *extended*. In specifications or designs, the variables are called *extension points*

  – Analyze their range

  – Extend the variables

  – Build variant solutions

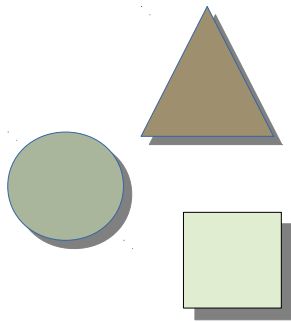# Zwicky's General Morphological Analysis (GMA), a Specific Variation Method

▶ [http://www.swemorph.com/ma.html]

▶ When variables and their values span up dimensions, they can be written up in a 2-d matrix, combinations can be formed of the values (value tuples).

  – The value tuples form a third dimension

▶ The structure is called **3-d morphological field**

▶ **Morphological analysis** works out, step by step, a 3-d morphological field by considering all combinations in the value tuple variant space

Variable 1	Parameter 2	Variable 3
Value 1.1	Value 2.1	Value 3.1
Value 1.2	Value 2.2	Value 3.2
Value 1.3	Value 2.3	
	Value 2.4	

Academic Skills for Computer Scientists, © Prof. Uwe Aßmann

71.2 Round-Robin Rotation Methods for Idea Generation

- for augmentation of ideas by groups

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635 Method for Brainwriting with your Friends

- ▸ The 635-Methode (Bernd Rohrbach (1968) is a method for round-robin brainwriting [Wikipedia:Methode_635]

- ▸ 6 people write 3 new ideas to what they see already, in 5 rounds

- ▸ First round: initial ideas into empty table

- ▸ Round 2-5: after rotation, look at the fillings and write the next row into the table

- ▸ 635 can be done for problems, problems and solutions, alternatives, and many more.

- ▸ 635 can be seen as a "group-GMA".

Idea 1	Idea 2	Idea 3

Science Speed Dating

► Participants sit at a table, with one on the opposite side

► Round 1: find an initial idea and draw it on a A3 sheet

► Round n: rotate to neighbor to the right, and work on the sheet there

► After: pin solutions to pinwalls and assemble comments, e.g., about the realisability of solutions and ideas

► Can be used for solution finding

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Problem Solving with VanGundy Problem Solving Method

▶ [VanGundy-ProblemSolving] contains a structured, very general process to solve structure problems: ARGESI

- – Problem analysis and Redefinition
- – Generating Ideas
- – Assessment and Evaluation of Ideas
- – Selection of ideas
- – Implementation and Realization

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71.2 Aspect-Oriented Problem Analysis with SWOT-BPOPP

Dijkstra on Separation of Concerns

E. W. Dijkstra "On the Role of Scientific Thought", EWD 447 Selected Writings on Computing: A Personal Perspective, pages 60–66, 1982.

"Let me try to explain to you, what to my taste is *characteristic for all intelligent thinking.*

It is, that one is willing to study in depth an aspect of one's subject matter in isolation for the sake of its own consistency, all the time knowing that one is occupying oneself only with one of the aspects.

We know that a program must be correct and we can study it from that viewpoint only; we also know that it should be efficient and we can study its efficiency on another day, so to speak. In another mood we may ask ourselves whether, and if so: why, the program is desirable. But nothing is gained --on the contrary!-- by tackling these various aspects simultaneously.

It is what I sometimes have called **"the separation of concerns"**, which, even if not perfectly possible, is yet the only available technique for effective ordering of one's thoughts, that I know of.

This is what I mean by "focussing one's attention upon some aspect": it does not mean ignoring the other aspects, it is just doing justice to the fact that from this aspect's point of view, the other is irrelevant. It is being one- and multiple-track minded simultaneously.

Intelligent thinking and scientific thought

Scientific thought comprises "intelligent thinking" as described above. A scientific discipline emerges with the --usually rather slow!-- discovery of which aspects can be meaningfully "studied in isolation for the sake of their own consistency", in other words: with the discovery of useful and helpful concepts. Scientific thought comprises in addition the conscious search for the useful and helpful concepts.

▸ BPOPP is a ZOPP-like problem and efficiency analysis that checks *blocking factors* preventing that objectives are reached.

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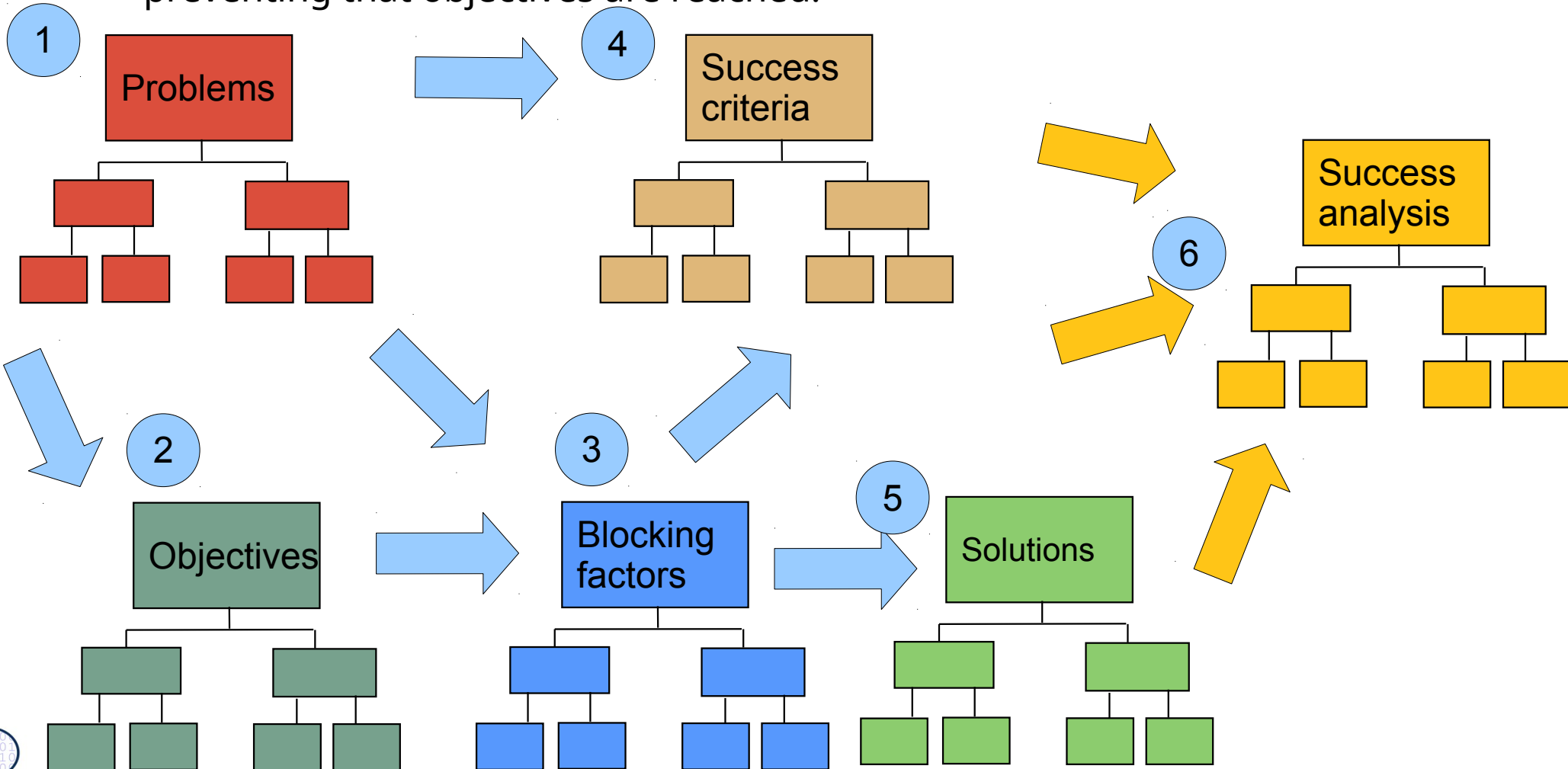
Purpose of Problem Analysis

► Analyzing the real demand of the customer, client, person, stakeholder

► Finding out ideas about what to sell to the customer

► Finding out niches in markets

► Do this for different perspectives of stakeholders

► Do this for different *concerns* or *aspects*

SWOT Analysis (Rpt.)

▶ SWOT ist eine 4-dimensionale Attributanalyse zur Ermittlung der Strategie einer Firma, eines Projekts [Albert Humphrey]

▶ Für strategische Entscheidungen

Strengthes

Unternehmensanalyse (Inweltanalyse)
Internal attributes

Umweltanalyse
External attributes

Threats

Opportunities

Or: Trends

Weaknesses
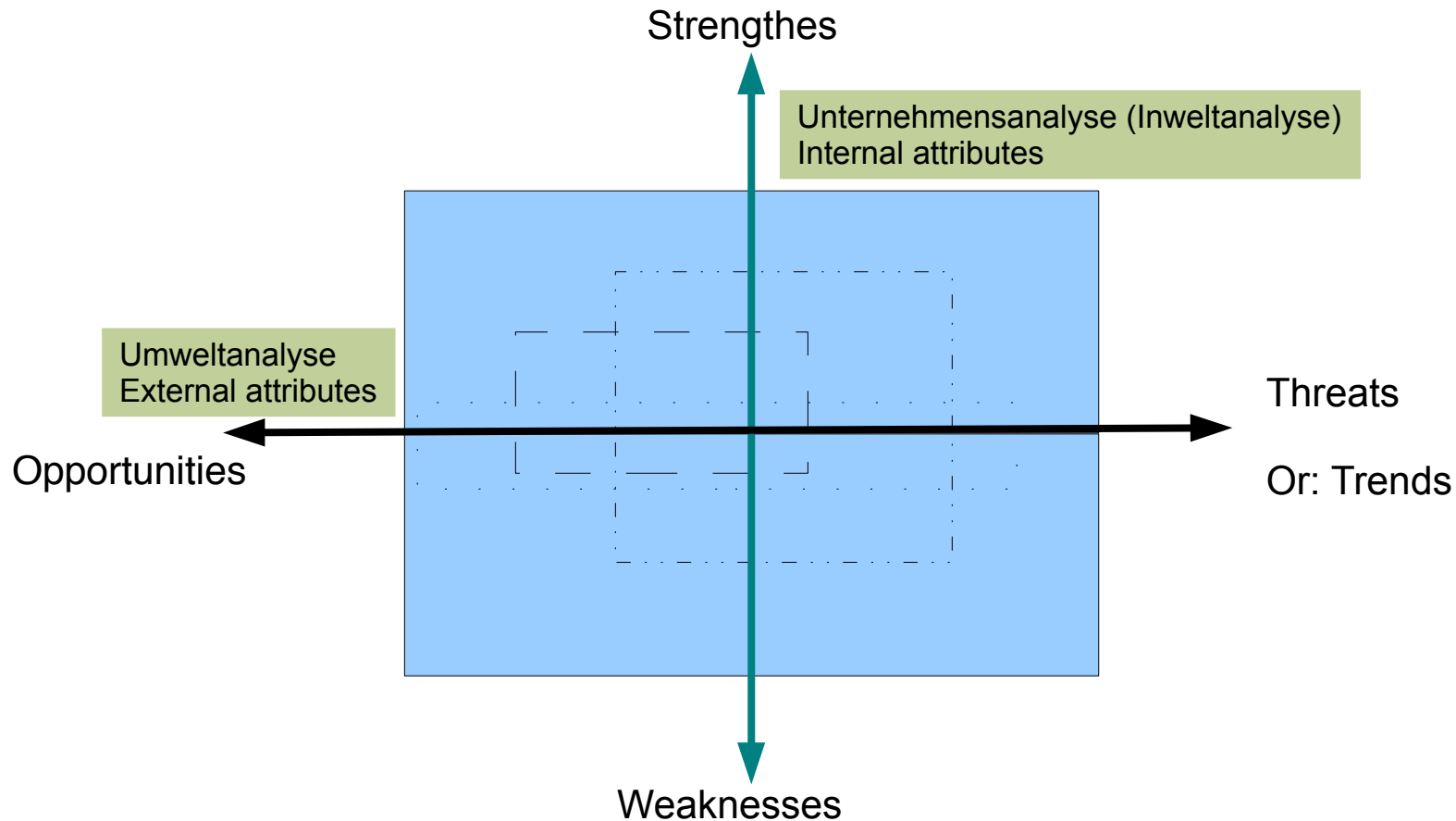
Aspect-oriented Problem Analysis (AO-POA)

An **aspect-oriented problem analysis** analyses a problem with a set of concerns in mind and produces a cross-product of a concern space with a problem analysis scheme

▶ The problem analysis method is done for all concerns

  – Concerns are compared

  – Quadratic many steps in the problem analysis (crossproduct)

▶ An **olympic AO-POA** uses an olympic concern space

▶ An **ef** ... s an efficiency conce...

SWOT	⋈	BPOPP
BeNeSiLo	⋈	ZOPP
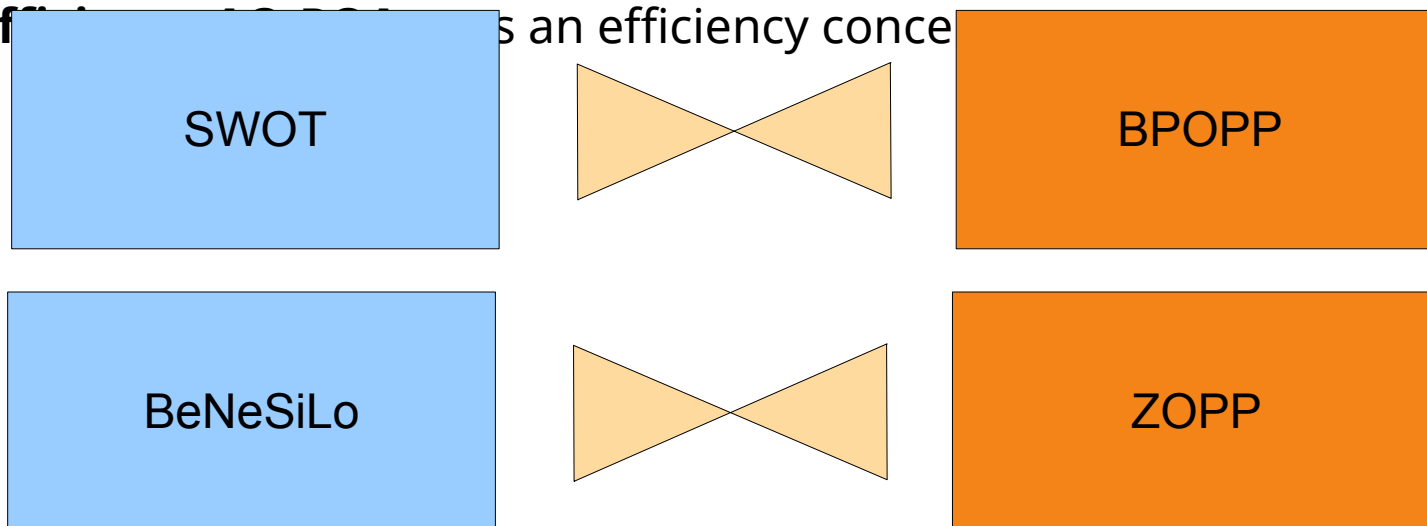
Alternative Notation for AOPA in Form of a Relational Matrix

▶ For any AO-POA, create a table and brainstorm on the crossproduct

	Problems	Objectives	Blocking factors	Success criteria	Solutions	Success proof
Strengthes						
Weaknesses						
Opportunities						
Threats						

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SWOT-BPOPP Problem Analysis

▶ SWOT-BPOPP is an *aspect-oriented problem analysis*

▶ SWOT are the *concerns (aspects)* of the customer or stakeholder (internal, external)

▶ BPOPP is the problem analysis

▶ SWOT-BPOPP is a **strategic problem-goal analysis**

Do a BPOPP problem-goal analysis for all SWOT
concerns (aspects) (internal and external) of the your customer.

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S

O

T

W

Problems to maintain strenghtes

Problems to encounter threats

Problems to realize opportunities

Problems to overcome weaknesses
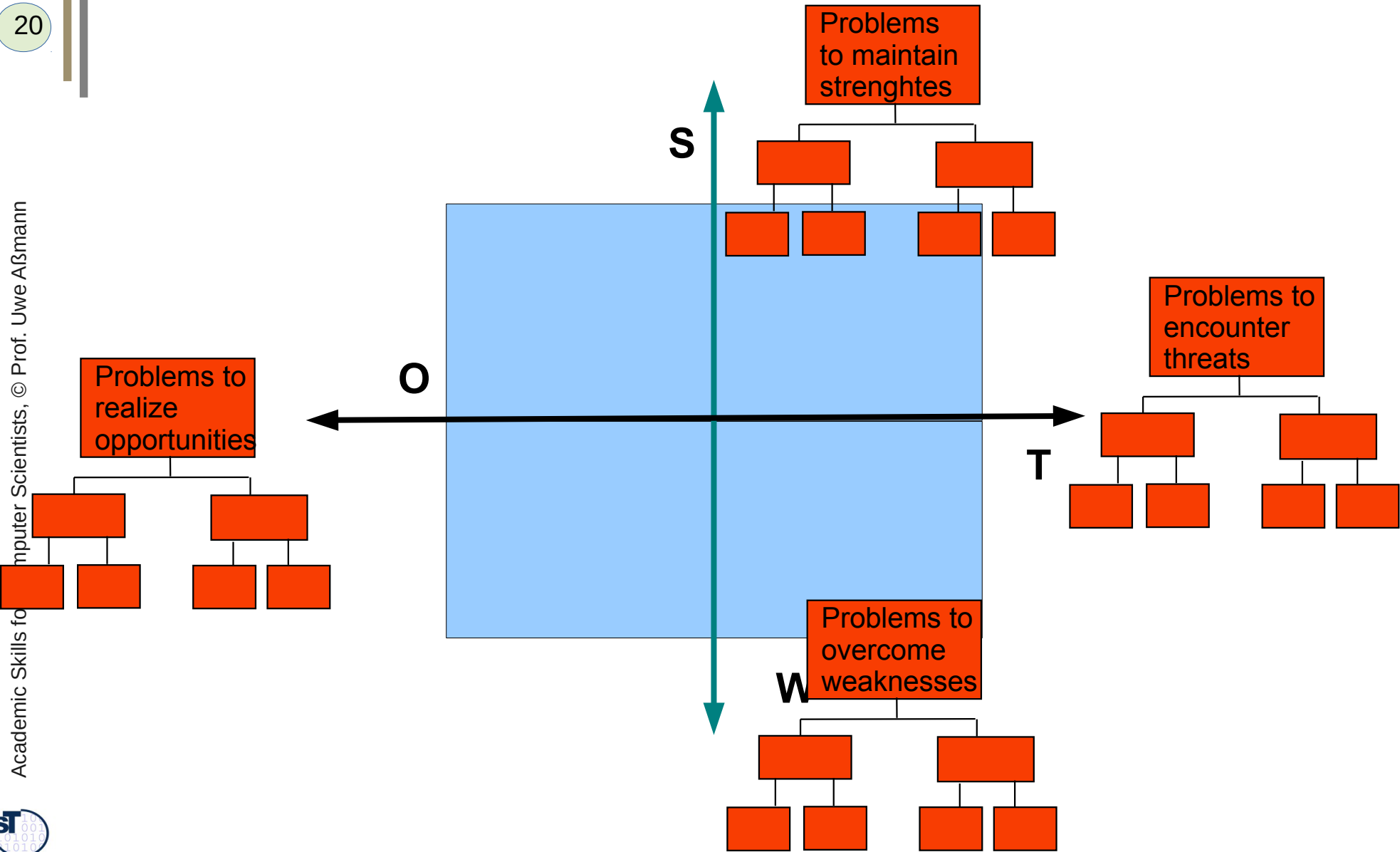
The Objectives World of the Customer, Analyzed by SWOT

Academic Skills for Computer Scientists, © Prof. Uwe Aßmann

S

Objectives to maintain strenghtes

O

Objectives to realize opportunities

T

Objectives to encounter threats

W

Objectives to overcome weaknesses
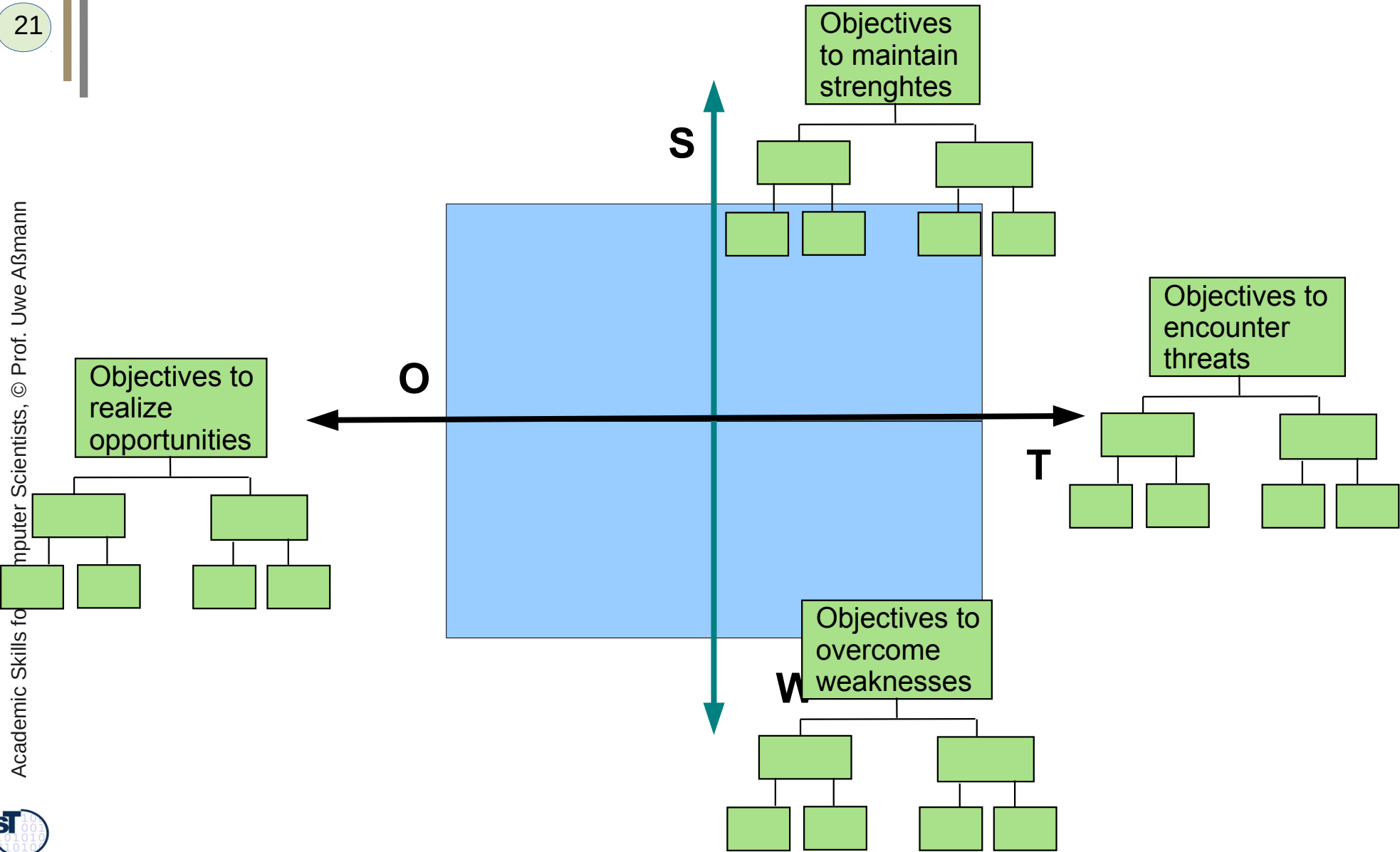
The Blocking Factors Preventing the Customer to reach her Goals, Divided by SWOT Concerns
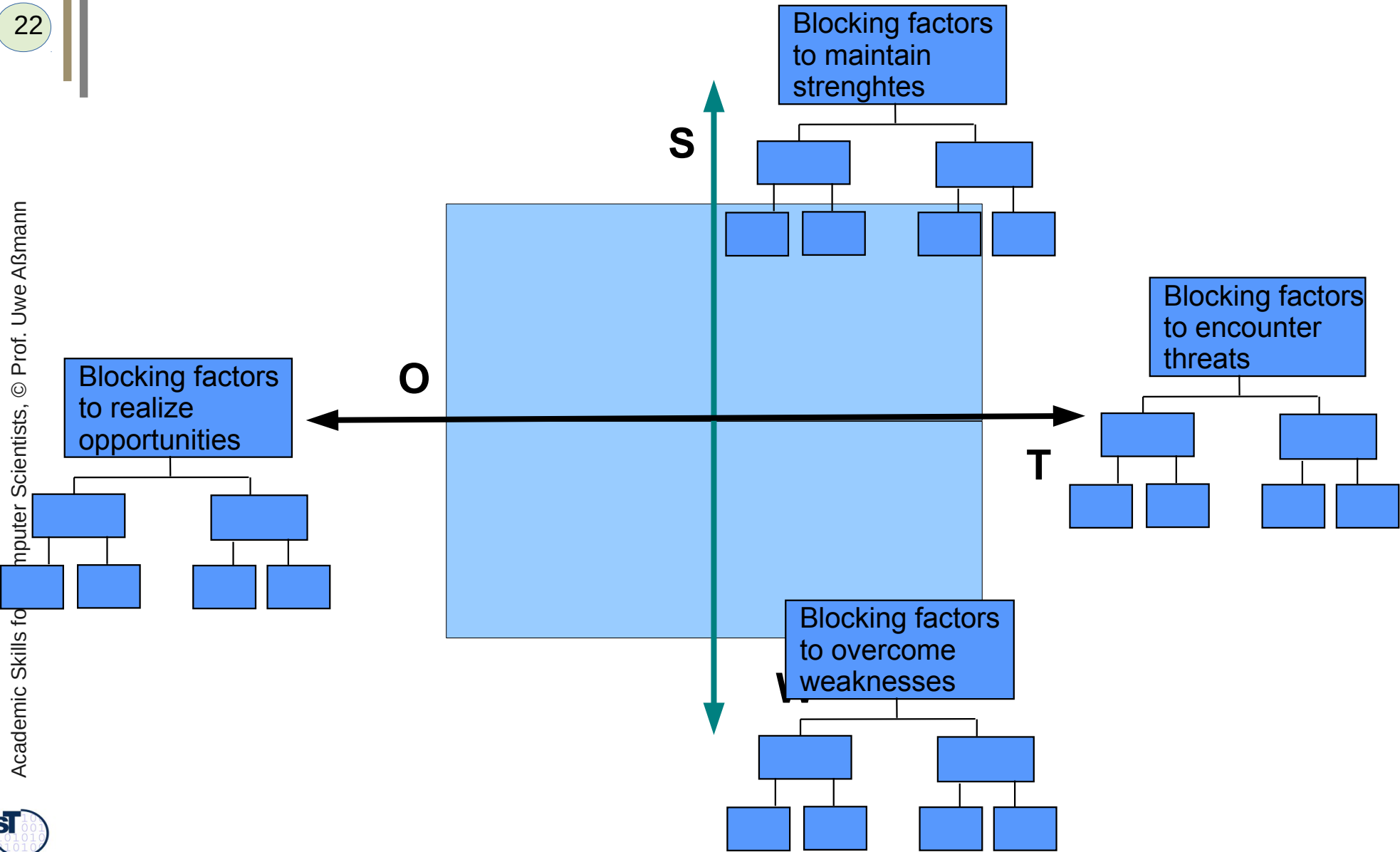
Academic Skills for Computer Scientists, © Prof. Uwe Aßmann

S

Blocking factors to maintain strenghtes

O

Blocking factors to realize opportunities

T

Blocking factors to encounter threats

W

Blocking factors to overcome weaknesses

The Success Analysis for the Customer

S

O

T

Success analysis for maintaining strenghtes

Success analysis for encountering threats

Success analysis for realizing opportunities

Success analysis for overcoming weaknesses

Academic Skills for Computer Scientists, © Prof. Uwe Aßmann
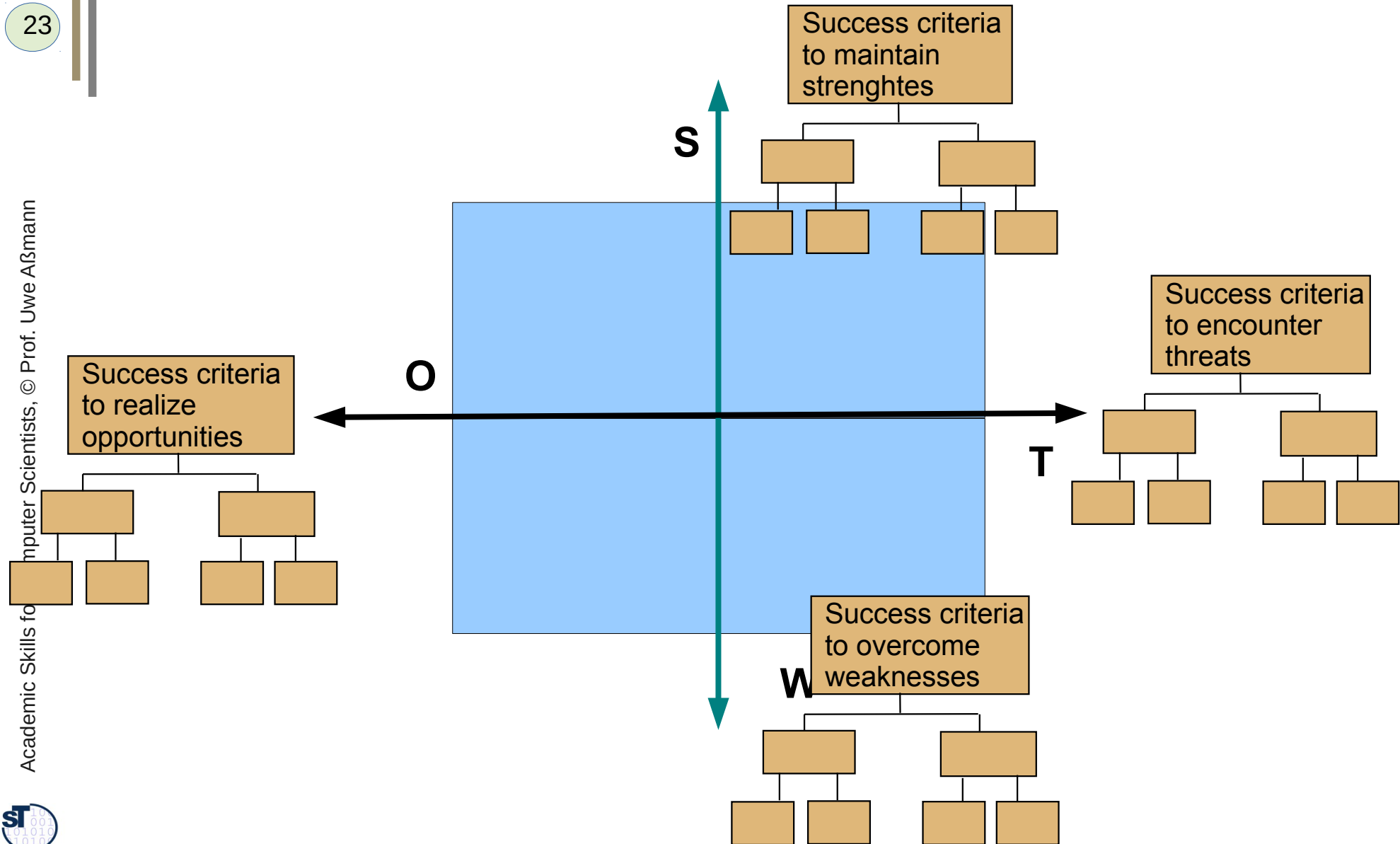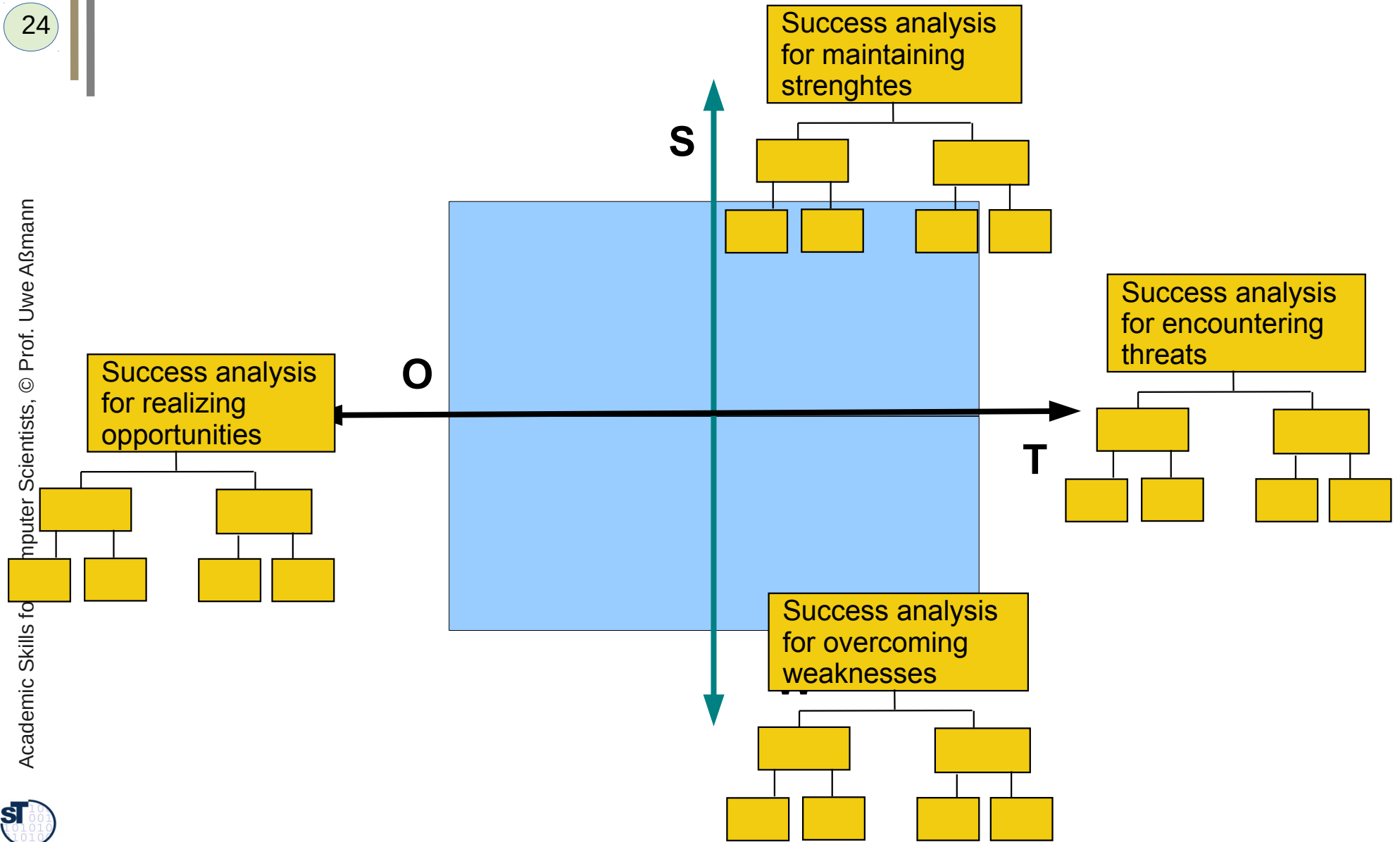
SWOT-BPOPP is an Aspect-Oriented Problem Analysis

► SWOT-BPOPP checks blocking factors preventing that objectives are reached, with regard to all aspects of SWOT. You will get ideas!!

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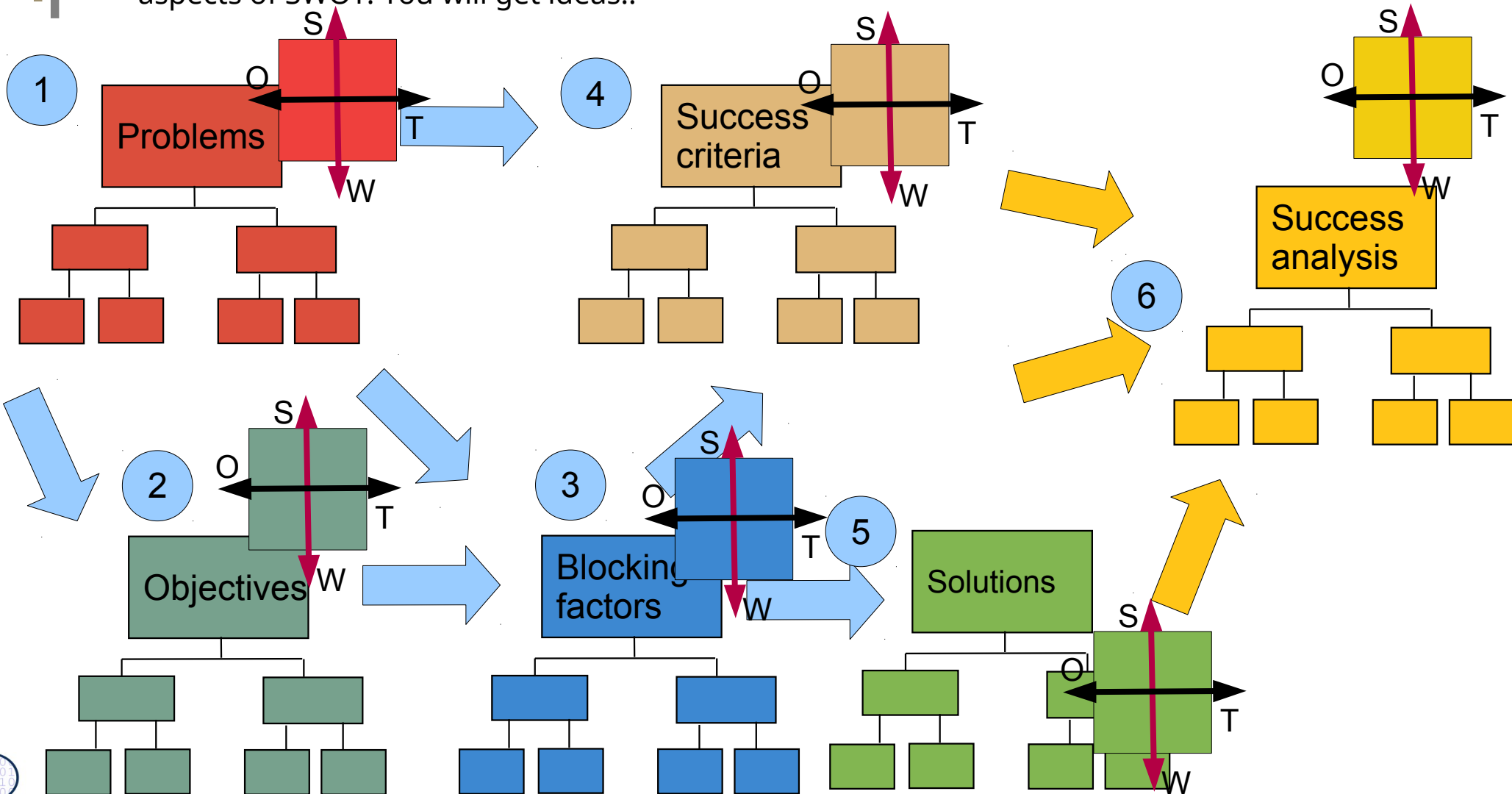
Alternative Notation for SWOT-BPOPP

▶ For any AO-POA, create a table and brainstorm on the crossproduct

	Problems	Objectives	Blocking factors	Success criteria	Solutions	Success proof
Strengthes						
Weaknesses						
Opportunities						
Threats						

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▶ Exc.: SWOT-BATEID-BPOPP Outline Analysis of Ritchie's Book on Wicked Problems

▶ Why is this a good scientific outline of a book?

▶ [Ritchie-Wicked] Go to http://www.springer.com/business+%26+management/technology+management/book/978-3-642-19652-2

▶ and download the free ToC

▶ http://www.springer.com/cda/content/document/cda_downloaddocument/97836 42196522-t1.pdf?SGWID=0-0-45-1173288-p174106575

▶ Where has he used SWOT?

▶ Where is the "success proof" of BPOPP?

▶ What are the technical and idealized problems?

▶ What are the "blocking factors"?

71.3 Aspect-Oriented Efficiency Analysis UCEW-BPOPP

- Utility-Cost, Efficiency-Waste
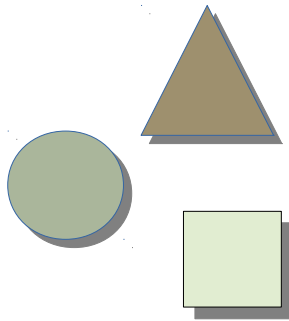
▶ UCEW can be used as concern space in an aspect-oriented problem analysis. It evaluates the efficiency (cost-utility relation).

▶ **Aspect-oriented efficiency analysis** combines an *efficiency concern space* with a problem analysis method.

  – The problem analysis method is done for all efficiency concerns

| UCEW Efficiency analysis | | BPOPP ZOPP NABC |
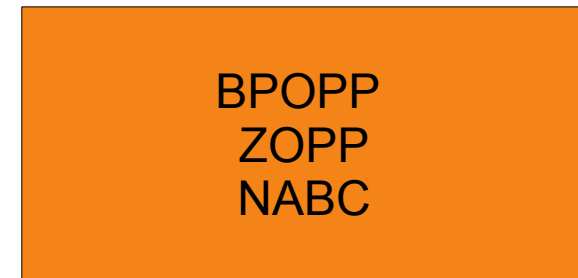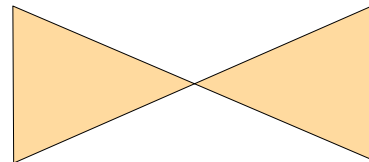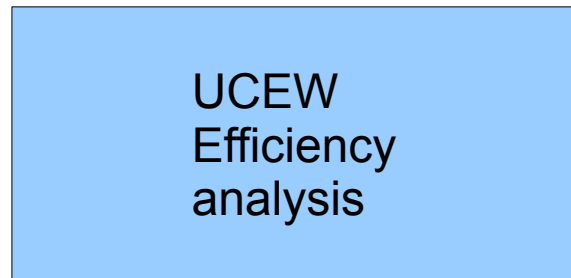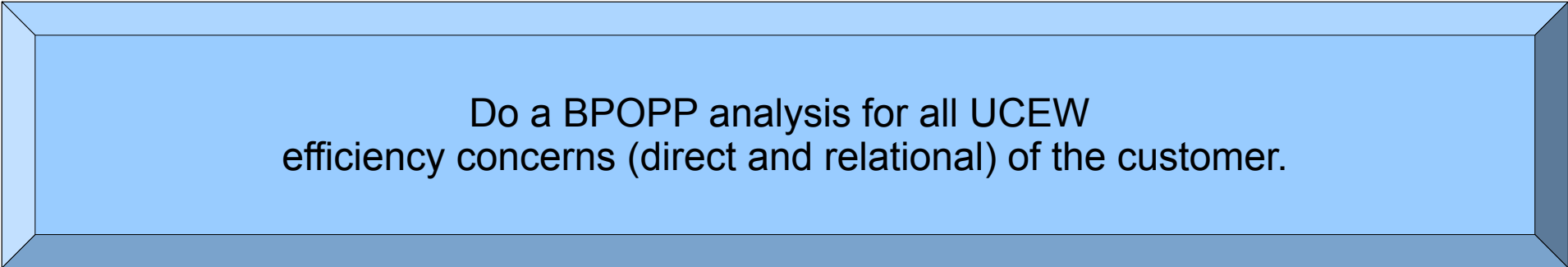
UCEW-BPOPP Efficiency Analysis

▶ UCEW-BPOPP is an *aspect-oriented problem analysis*

▶ UCEW are the concerns of the customer or stakeholder (internal, external)

▶ BPOPP is the problem analysis

Do a BPOPP analysis for all UCEW
efficiency concerns (direct and relational) of the customer.

Problems to achieve utility

Problems to raise efficiency

Problems with waste

Problems to reduce costs

U

E

W

C

- Delivery goals
- Waste reduction goals
- Cost reduction goals
- Efficiency improvement goals
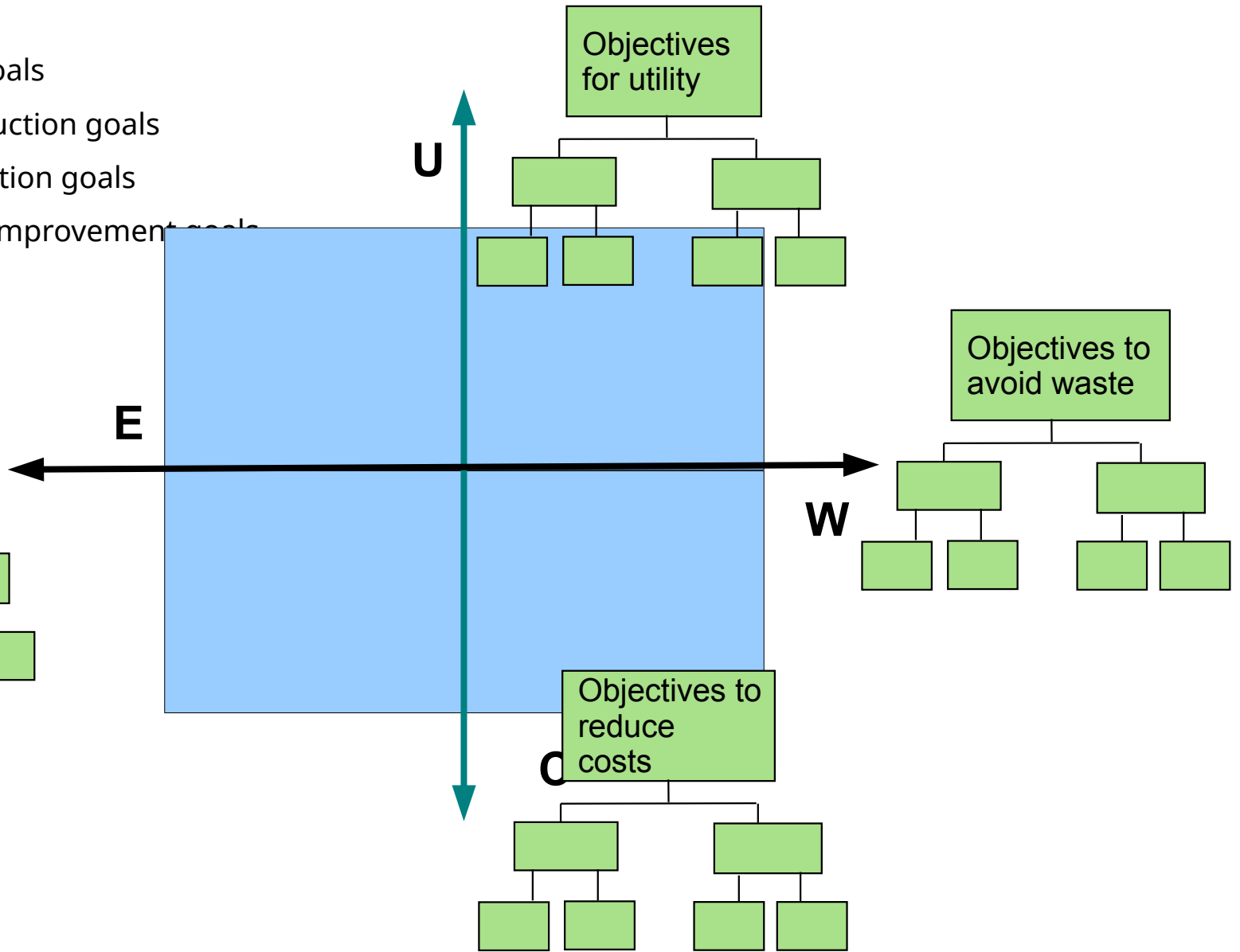
U

E

W

O

Objectives for utility

Objectives to avoid waste

Objectives to raise efficiency

Objectives to reduce costs

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U

E

W

Blocking factors to achieve utility

Blocking factors to reduce waste

Blocking factors to raise efficiency

Blocking factors to reduce costs
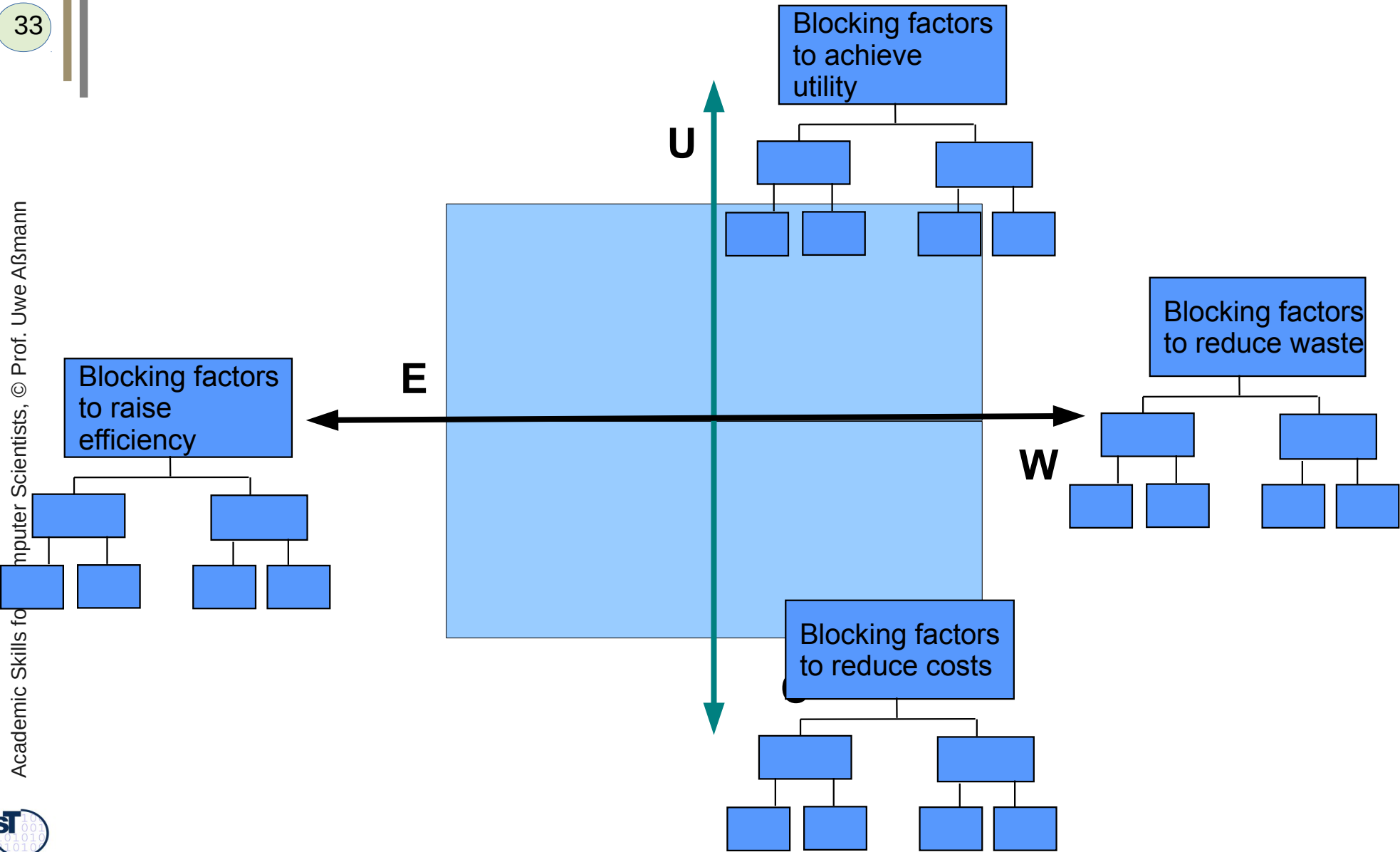
The Efficiency Success Criteria of the Customer

Success criteria to maintain strenghtes

Success criteria to avoid waste

Success criteria to realize efficiency

Success criteria to reduce cost

U

E

W

C

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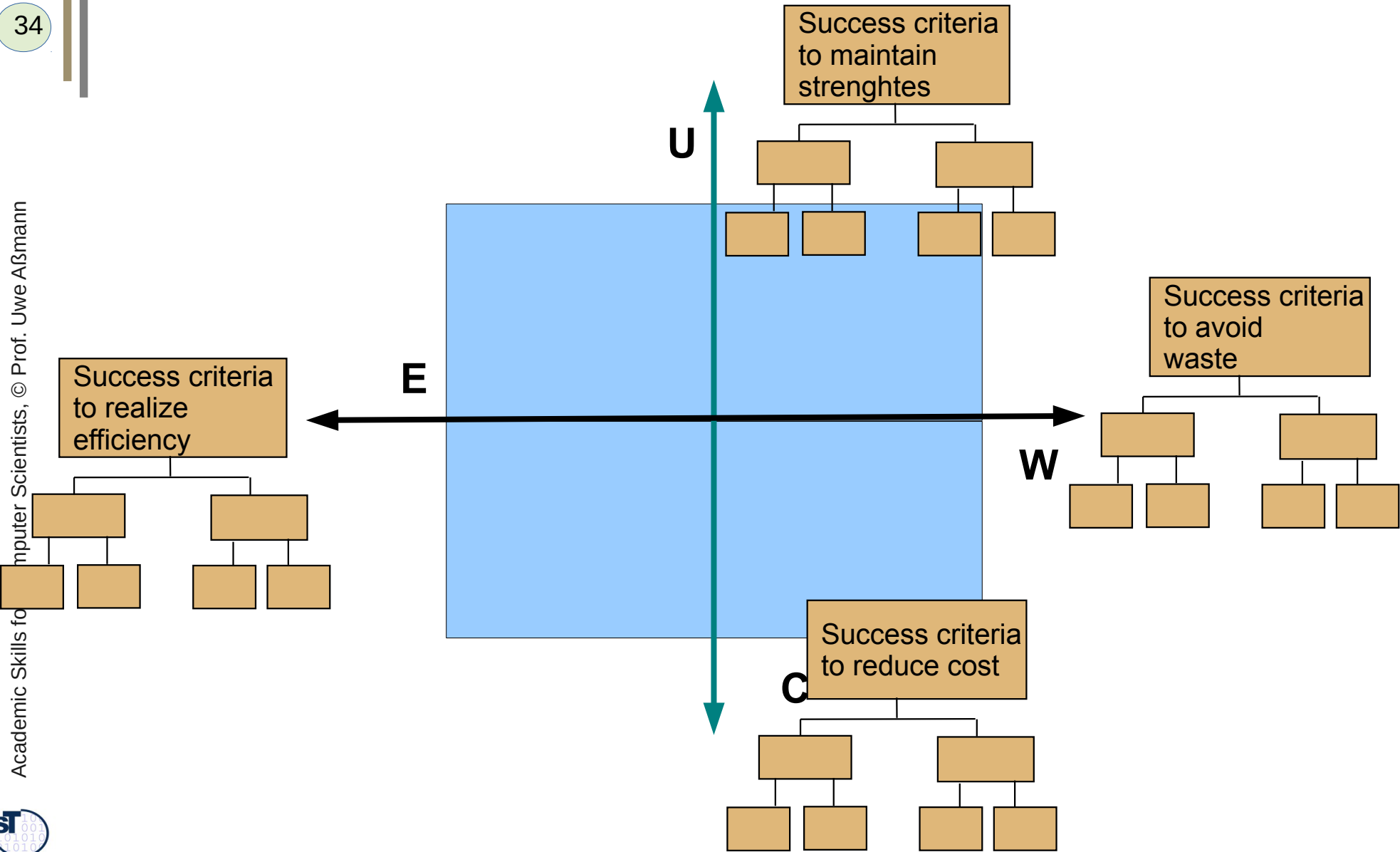
The Efficiency Success Analysis for the Customer

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Success analysis for maintaining strenghtes

U

Success analysis for realizing efficiency

E

W

Success analysis for avoiding waste

Success analysis for reduce costs
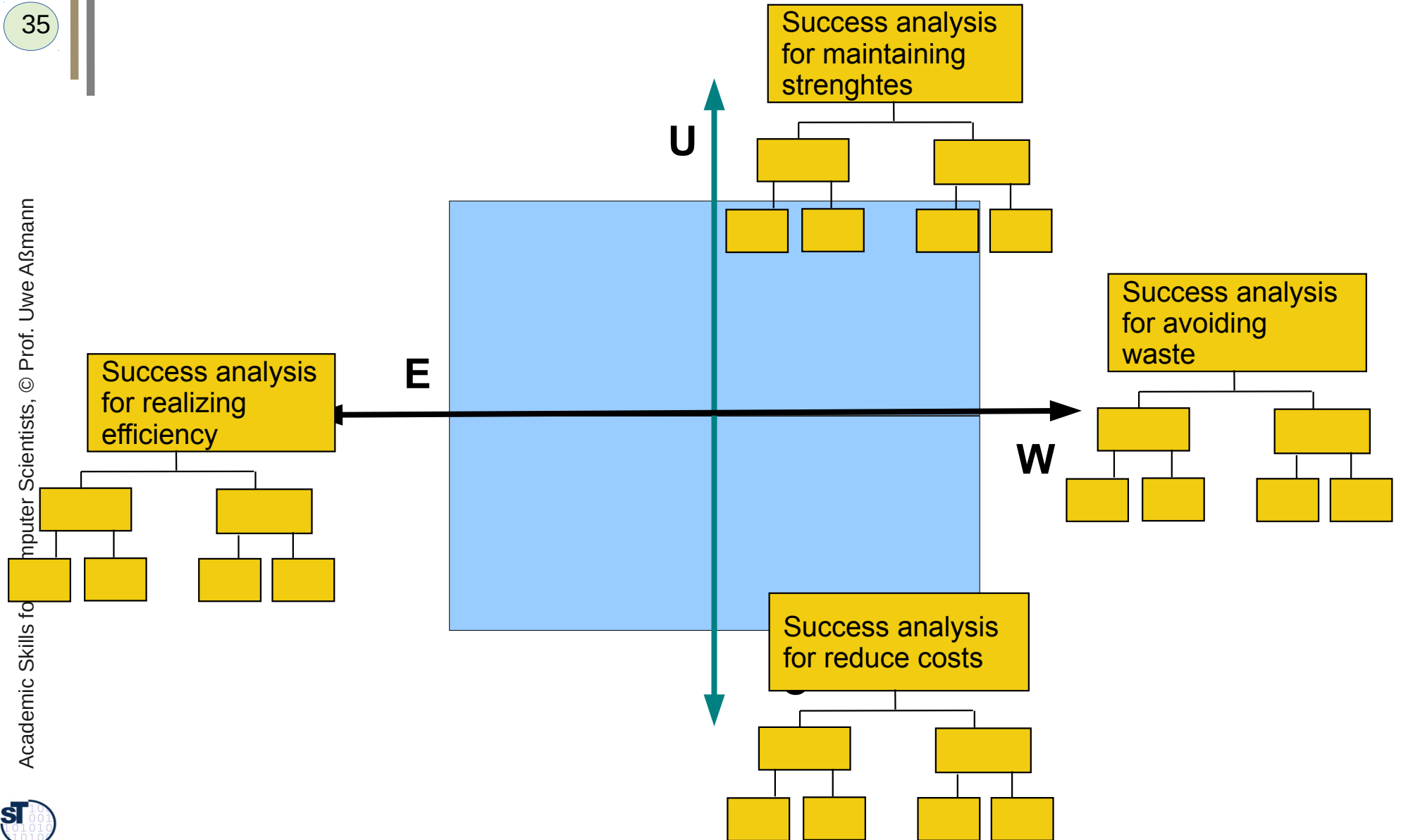
UCEW-BPOPP in One Slide

▶ UCEW-BPOPP analyses problems with efficiency concerns in mind.
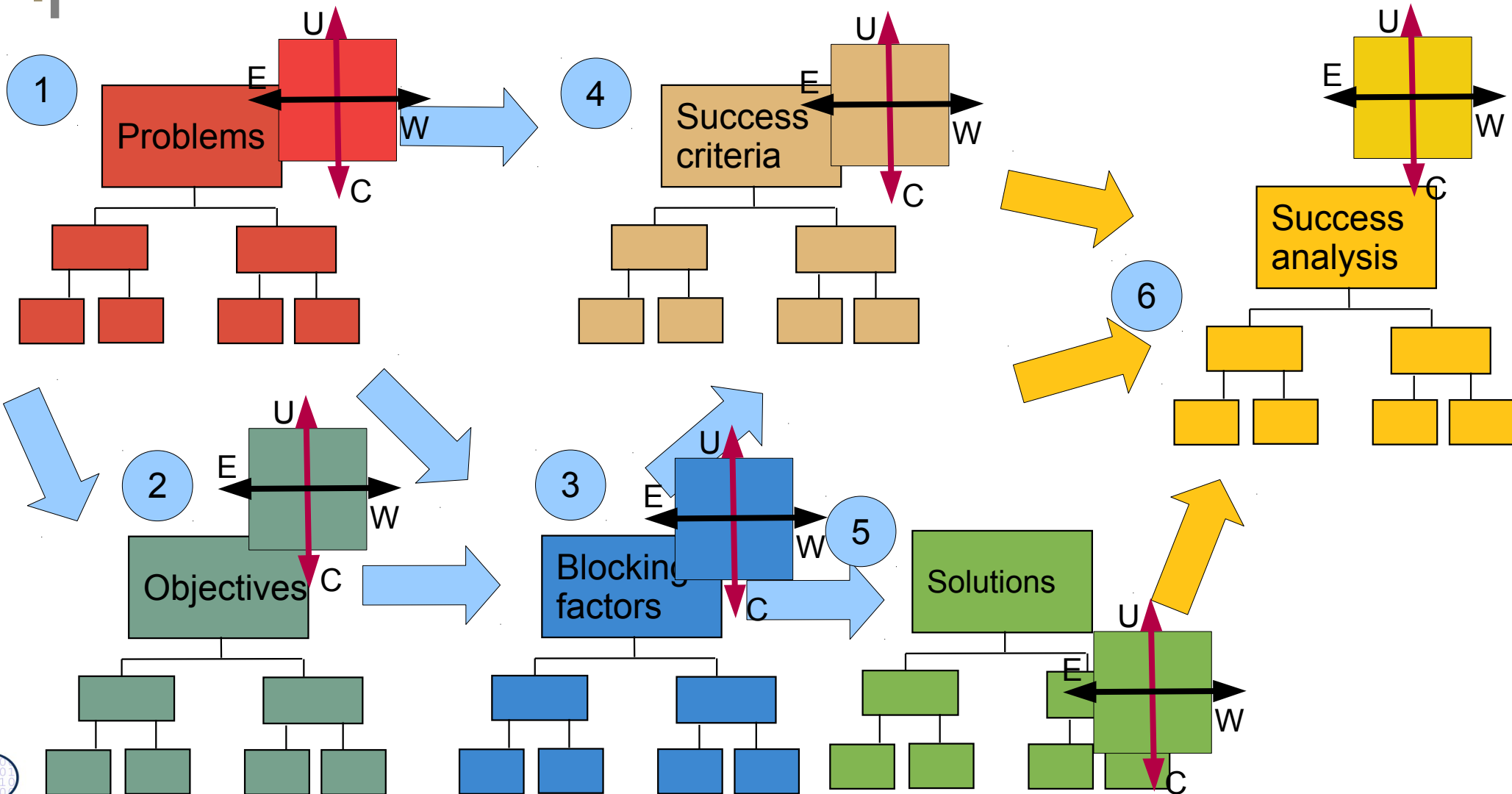
Aspect-Oriented Problem Analyses

▶ Dijkstra said "Separation of Concerns is about intelligent thinking"

SWOT	▷◁	BPOPP ZOPP NABC
UCEW	▷◁	BPOPP ZOPP NABC
The 6 honest serving men	▷◁	GQM
BeNeSiLo	▷◁	GQM

"efficiency"
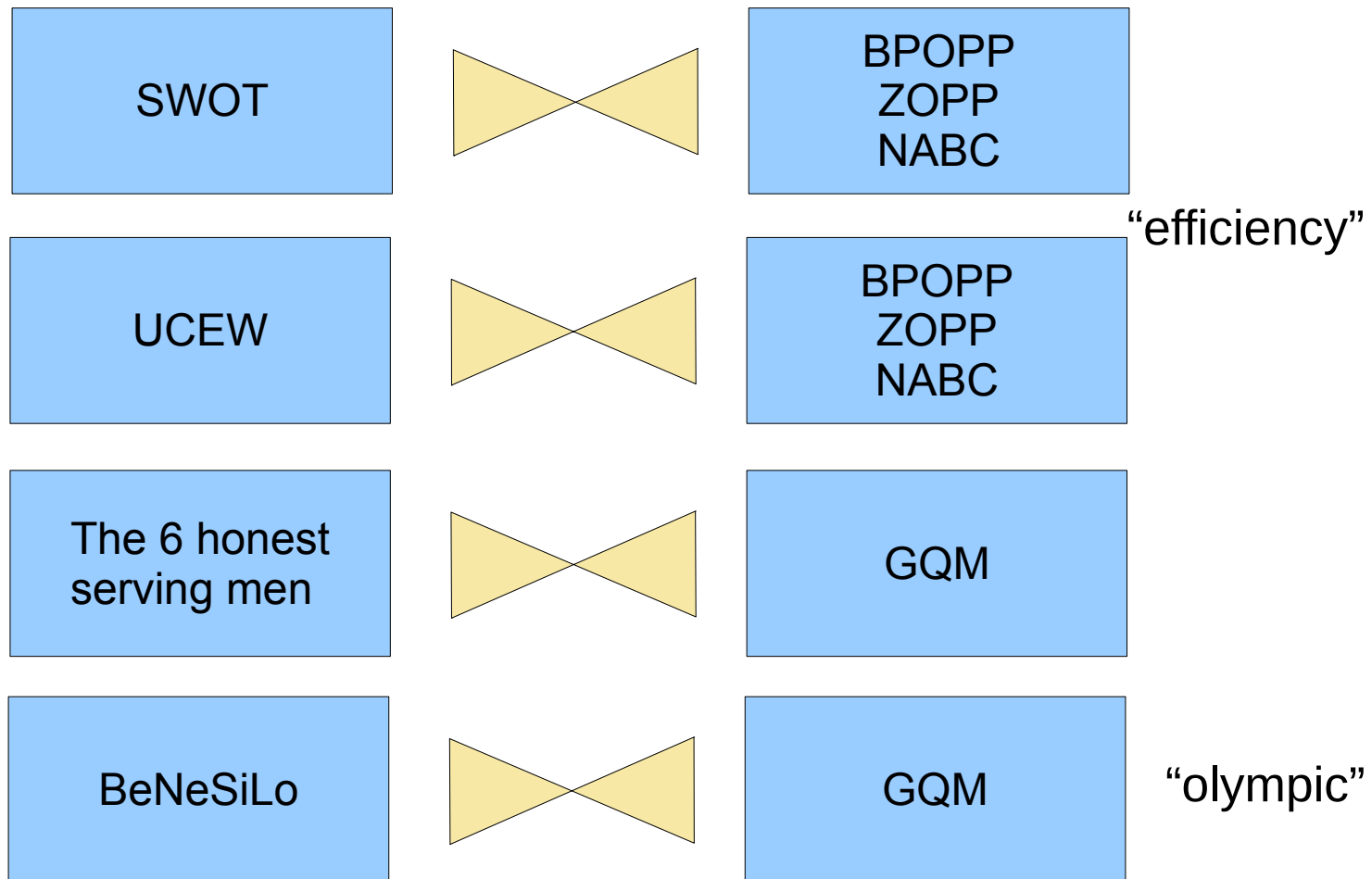
"olympic"

How to Apply AO-POA to Your Research?

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▶ **Information Gathering:** Comparison of Literature

- Find with a SWOT-BPOPP gaps in the state of the art

▶ **Finding research questions and hypothesis:**

- Research questions and hypothesis can be *olympic* or *efficiency-based*
- With a BeNeSiLoo-POPP, finding possible improvements of another approach is easy "faster, higher, farer"
- With an CoTiQQ- or UCEW-BPOPP, finding inefficiencies is easy
- "Finding inefficiency means finding opportunity" (Barrack)

▶ **Finding ideas for solutions**

- Often, from the blocking-factor-problem-goal analysis, an idea for a technology emerges

▶ **Writing studies for other people**

- As a consultant, for strategic problem and objective analysis, you can earn money. With a SWOT-BPOPP, you always deliver something interesting

▶ **Writing overview papers**

- For instance, for the paper, we will write.

# How to develop an Aspect-Oriented Problem Analysis (AOPA) Yourself

▶ Generate

- – 1) Find a concern space (2d, 3d, 4d, tree-shaped etc.)
- – 2) Fix a problem analysis method (BPOPP, ZOPP, GQM, ...)
- – 3) Fix the crossproduct analysis
- – 4) Fix crossfertilization steps

▶ Prioritize

- – Create a prioritized problem list with a multi-criteria analysis

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71.4 Example: Strategy Analysis in Start-Ups with Balanced Score Card
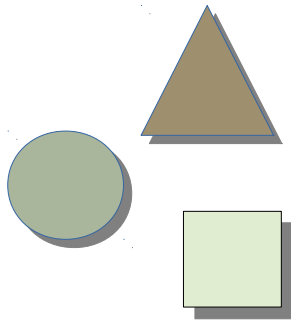
The Balanced Score Card is a 4-Aspect POPP

Academic Skills for Computer Scientists, © Prof. Uwe Aßmann
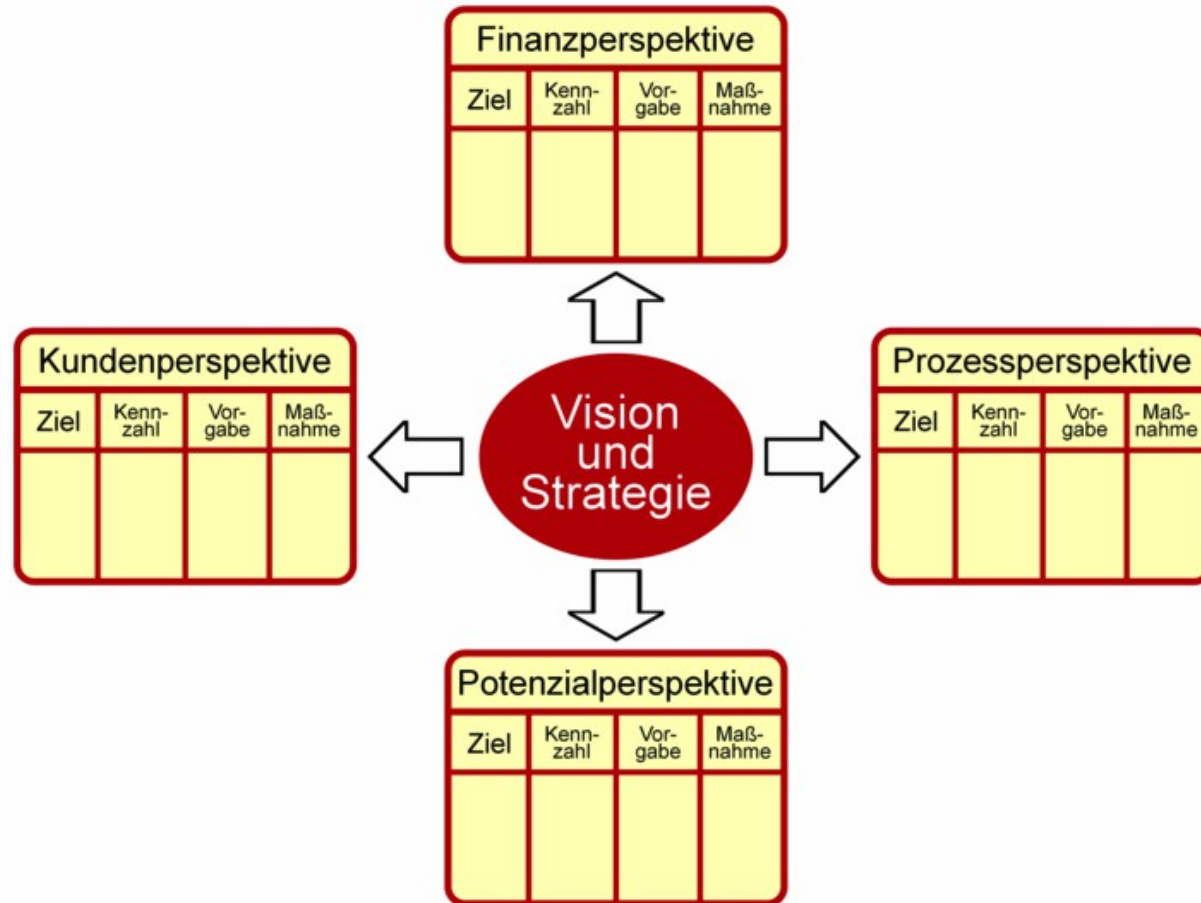
Kaplan/Norton Aspects/Dimensions

▶ Internal = (Financial, Processes) x External = (Potential, Customer)

Financial

Internal

Potential
(Learning and
Growth)

Customer

External

(Internal business) Processes
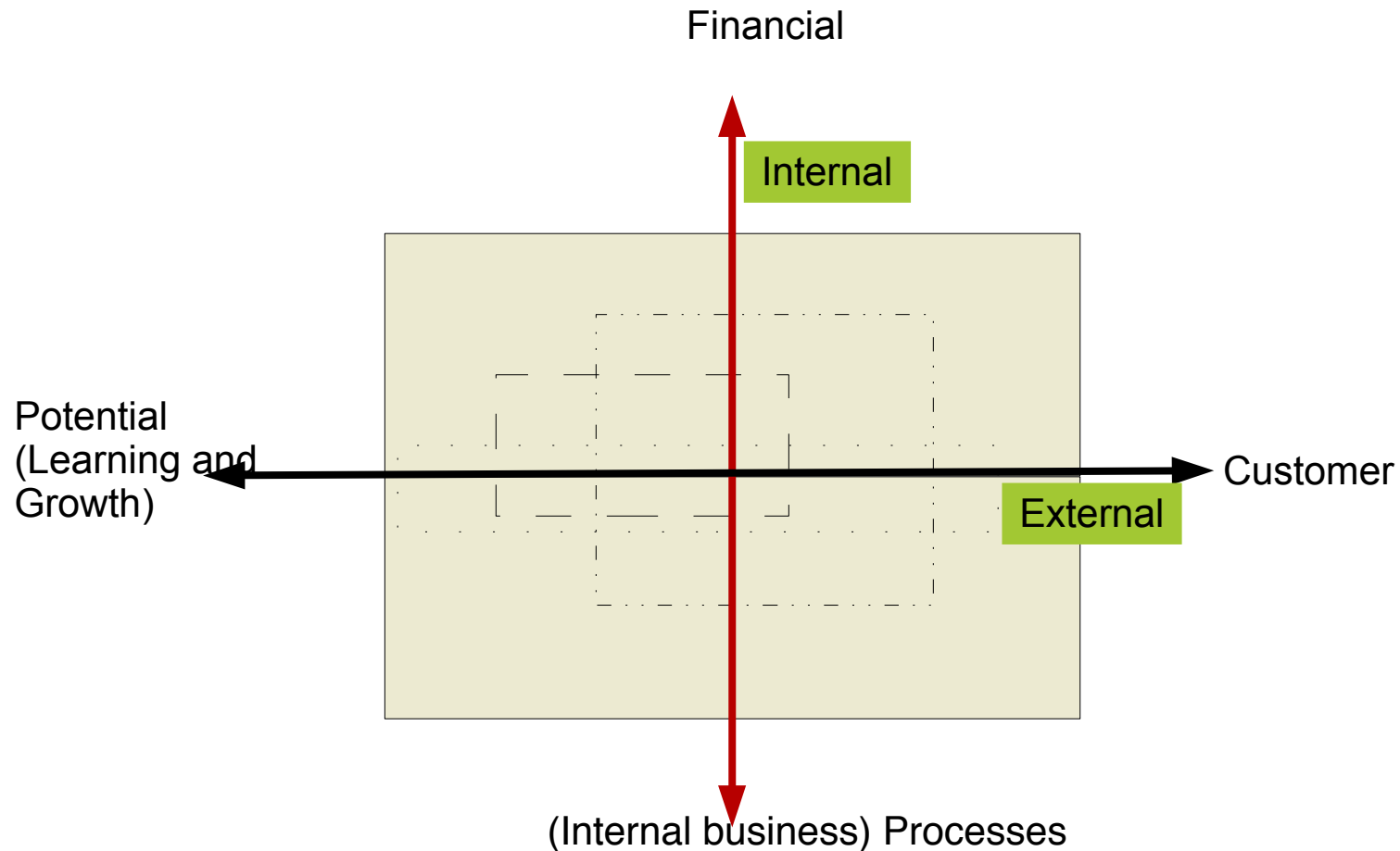
BSC as SoC-Space

- ▶ A Balanced Score Card is a SoC-Space between a concern set and a goal set
  - – Perspectives/Concerns = { Financial, Customer, Internal Processes, Learning/Growth }
  - – Goals {Objective, KPI (Kennzahl), Threshold, Measure }

Kaplan/Norton-Perspectives

KPI-ZOPP
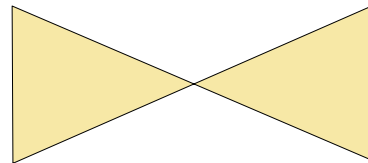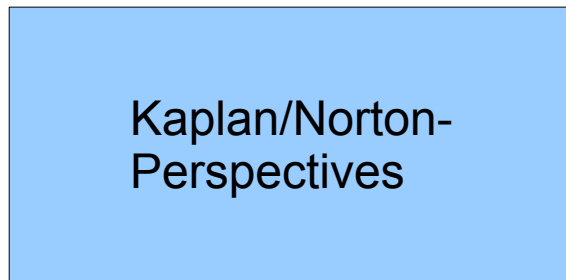
Corporate Strategy Map

► Die Strategy Map ist eine Ursache-Wirkungsanalyse in den Kaplan/Norton-Perspektiven.

- Die 4 Perspektiven des Kaplan/Norton-BSC kann man schichten, d.h. in eine willkürliche Reihenfolge bringen

- In den Schichten werden die Maßnahmen/Aktivitäten angeordnet und ein eine Ursache-Wirkungs-Beziehung gebracht

- Es entsteht ein Ursache-Wirkungs-Graph zwischen Maßnahmen

Corporate Strategy Map

45

Corporate Strategy Map
Mayberry Utilities Commission
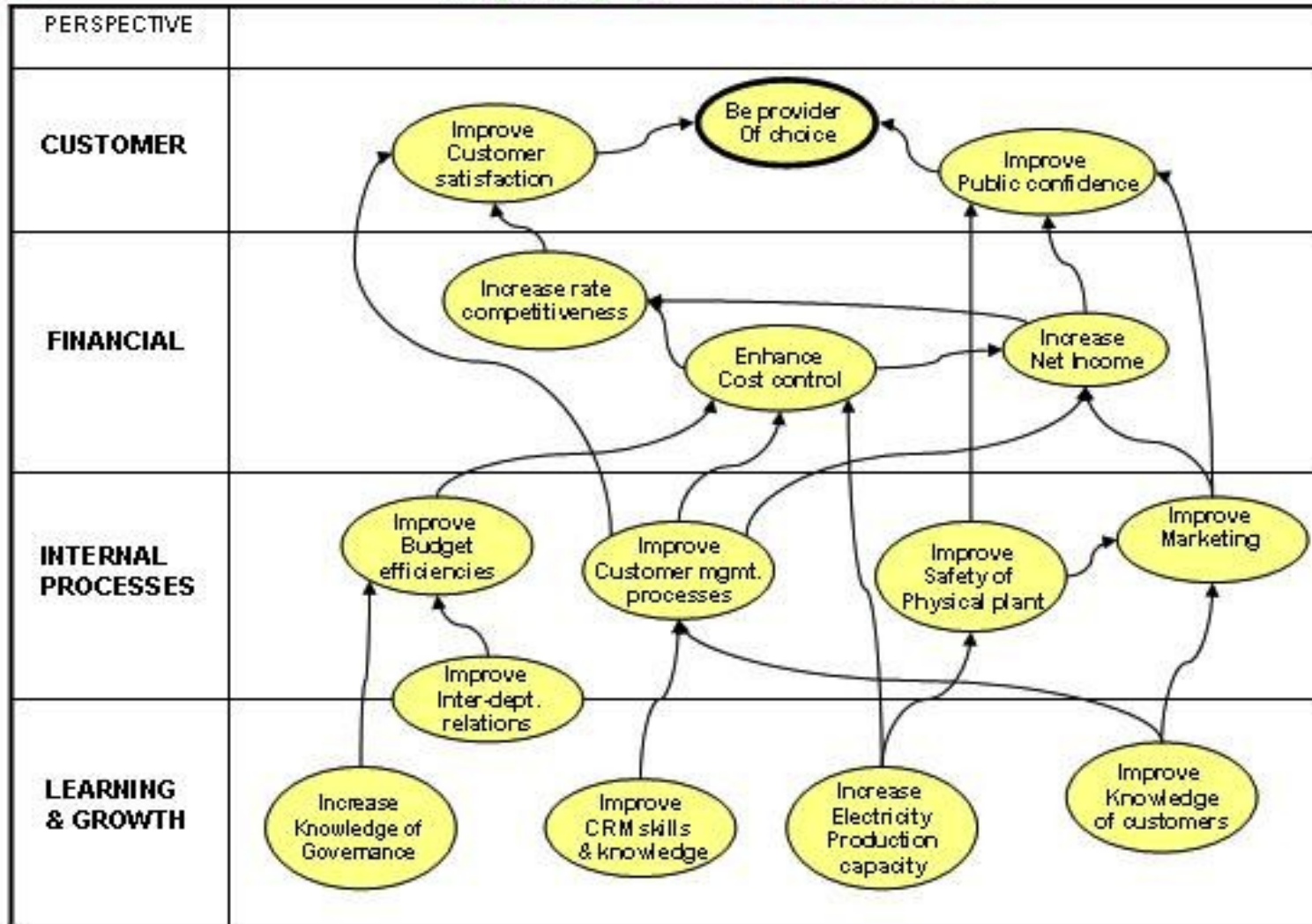
Arbeitshilfe zur Balanced Scorecard von Firma / Organisation / Bereich xyz (Version / Datum)

zu Validierung jeweils bzw. wo sinnvoll Objekt-Abhängigkeiten (Schätzung, Wahrnehmung, Korrelation) in Werten angeben (z.B. Skala von - 3 bis + 3)

http://upload.wikimedia.org/wikipedia/commons/thumb/8/89/Bsc_Arbeitshilfe.pdf/page1-800px-Bsc_Arbeitshilfe.pdf.jpg

Exc.:

► Generate ideas for improvement of the paper of Vinoski

► Do a BeNeSiLoo-BPOPP with his middleware appraoches in section "Evolution"

► Then, do a SWOT-BPOPP to generate ideas for the section "Future"

▶ Do an efficiency AO-POA for Germany's move to natural energy

▶ Do an olympic AO-POA for your salary and employment

▶ Do a GQM for the question "What Dresden should do to keep its welfare 30 years after the Wende"

The End

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Appendices

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