TECHNISCHE UNIVERSITÄT
CHEMNITZ

Faculty of Computer Science
Professorship Distributed and self-organizing Systems

Good bye conversion rate

a smarter way to optimising Search Engine Results Pages

///// IS-SWIS 2017, Rotterdam, February 9, 2017///

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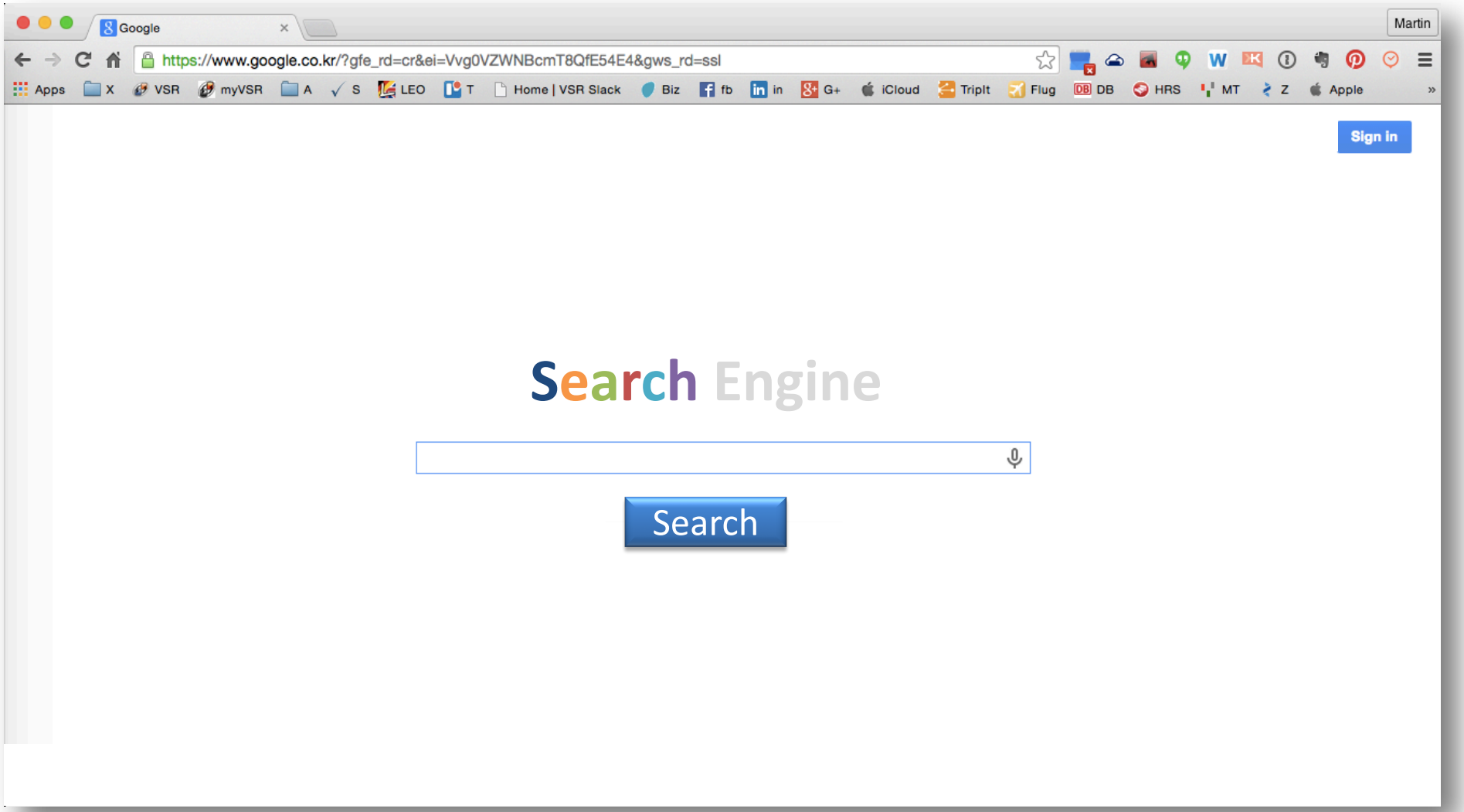
VSR.Informatik.TU-Chemnitz.de


Google
Martin
https://www.google.co.kr/?gfe_rd=cr&ei=Vvg0VZWNBcmT8QfE54E4&gws_rd=ssl
Apps
X
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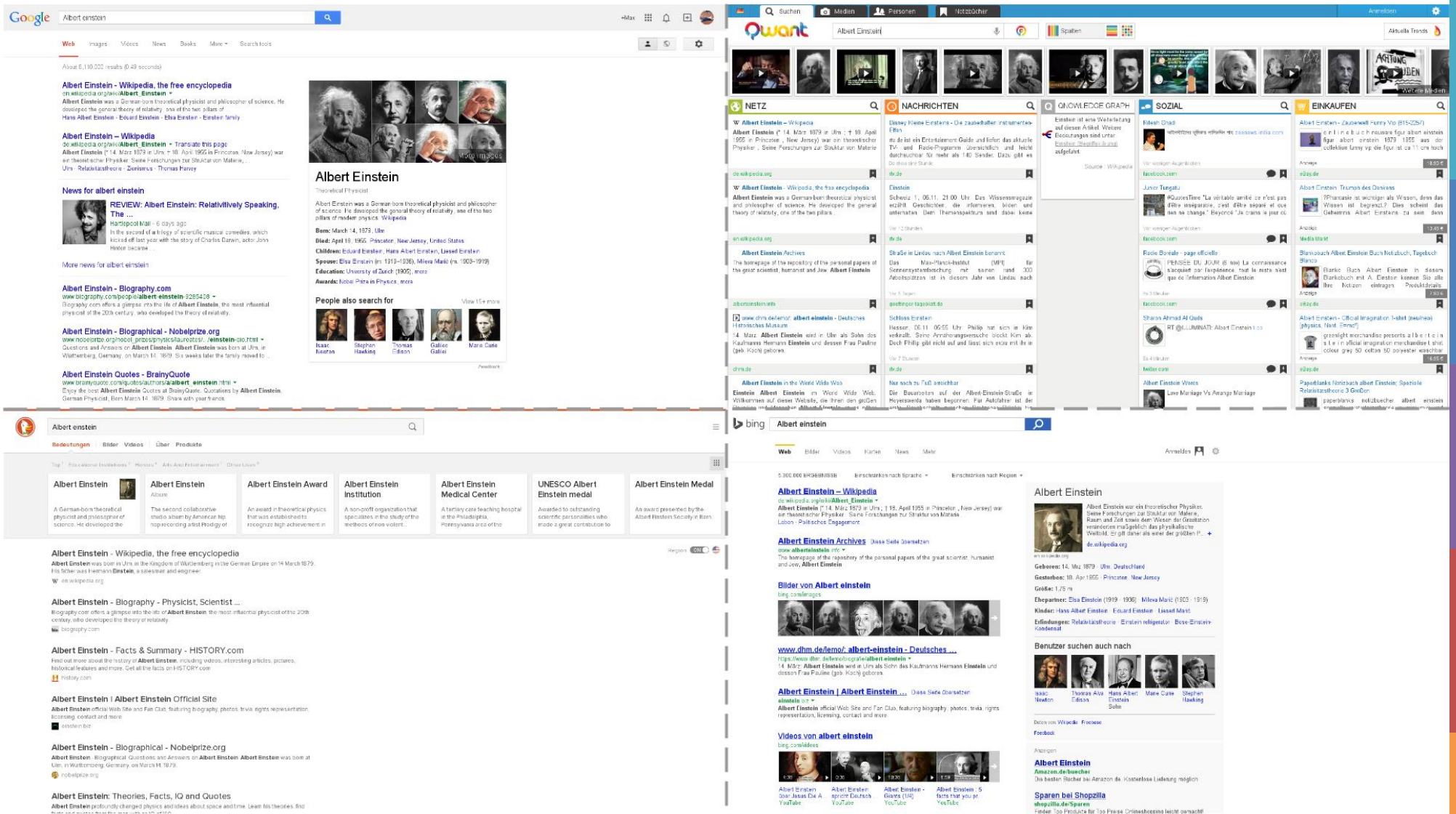
Apple
Sign in
Search Engine
Search

Search Engine Result Pages (SERPs)



(simplified) Motivation

Evaluation Method	Efficient?	Effective?
User Testing	✗	✓
Usability Inspection	✗	✓
Split Testing	✓	✗

Split Testing

Version A

Version B

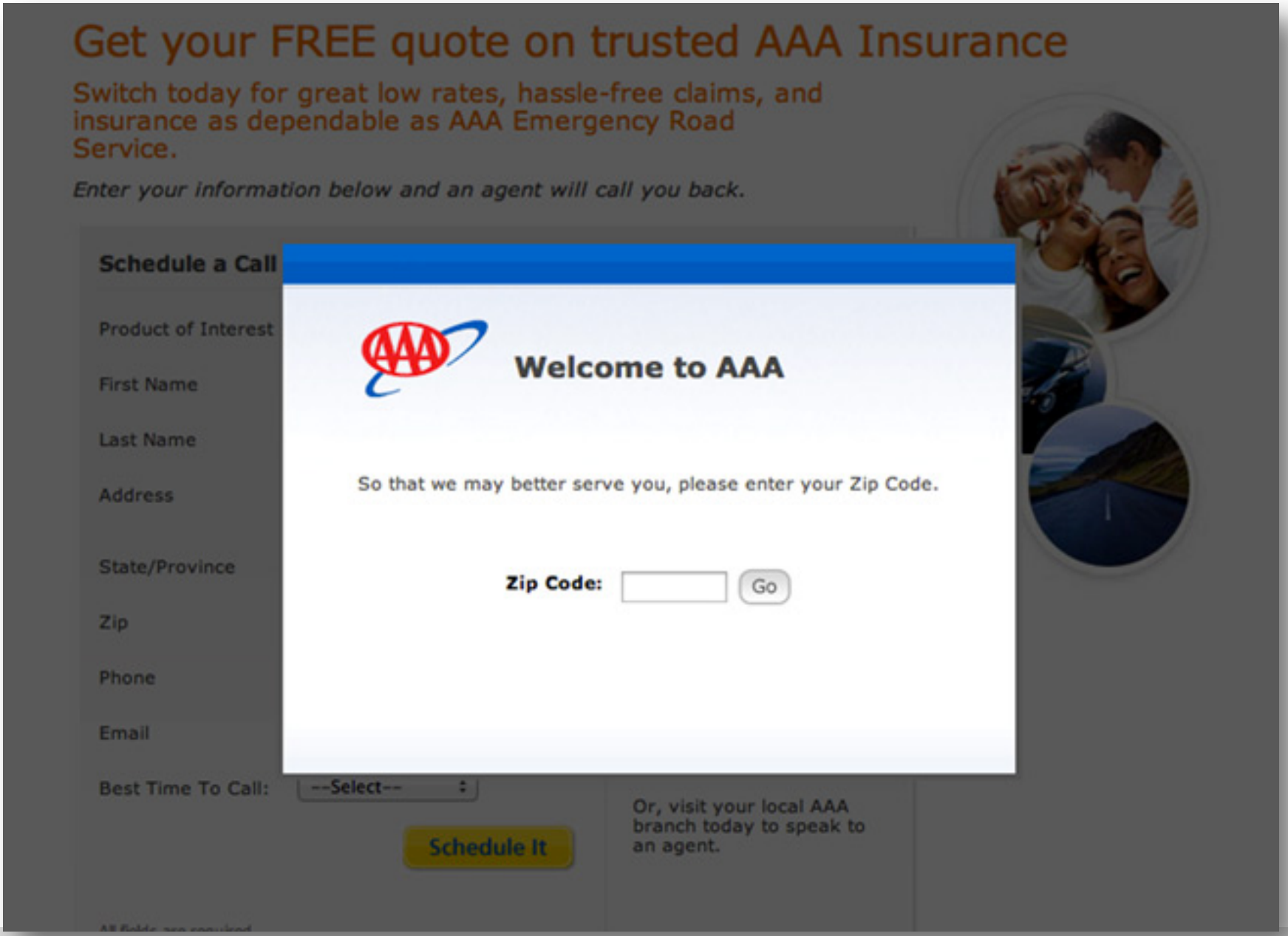
The problem with Split Testing

Conversion Rate:
proportion of visitors to a website who take action due to subtle requests from marketers, SEOs, (semantic) data providers etc.

$$\text{Conversion rate} = \frac{\text{Number of Goal Achievements}}{\text{Visitors}}$$

(source: Wikipedia.com)

Version A: Getting the User's Zip Code



$$$ ≠ Usability

Jakob Nielsen: Putting A/B Testing in Its Place,
http://www.nngroup.com/articles/putting-ab-testing-in-its-place/

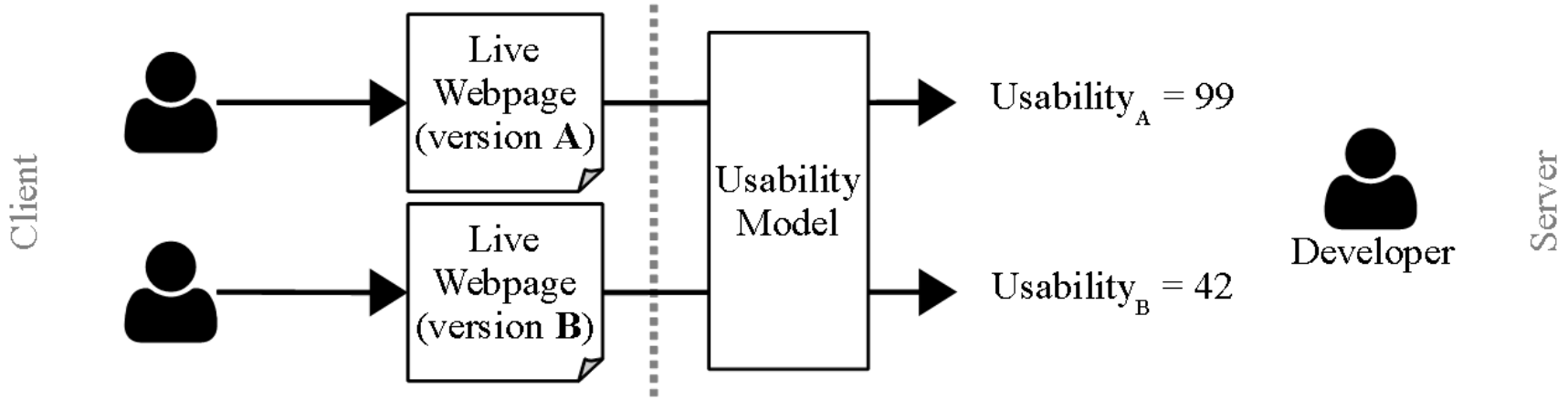
Goal:

to leverage the advantages of split testing AND to facilitate effective usability evaluation

Idea:

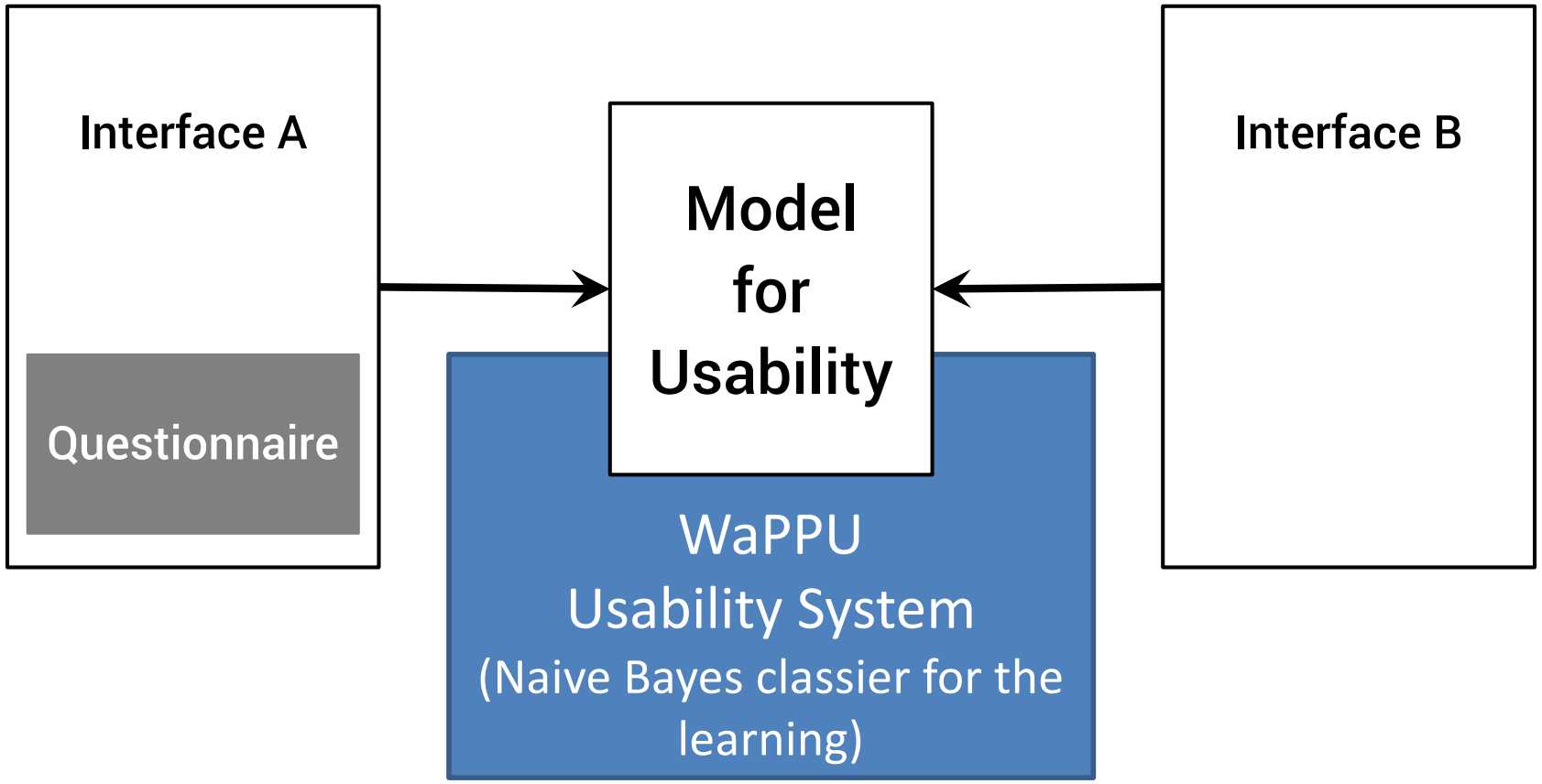
Rethink the target measure from the users point of view (i.e. development & user – not sales) :

Usability as a **measure** for split testing



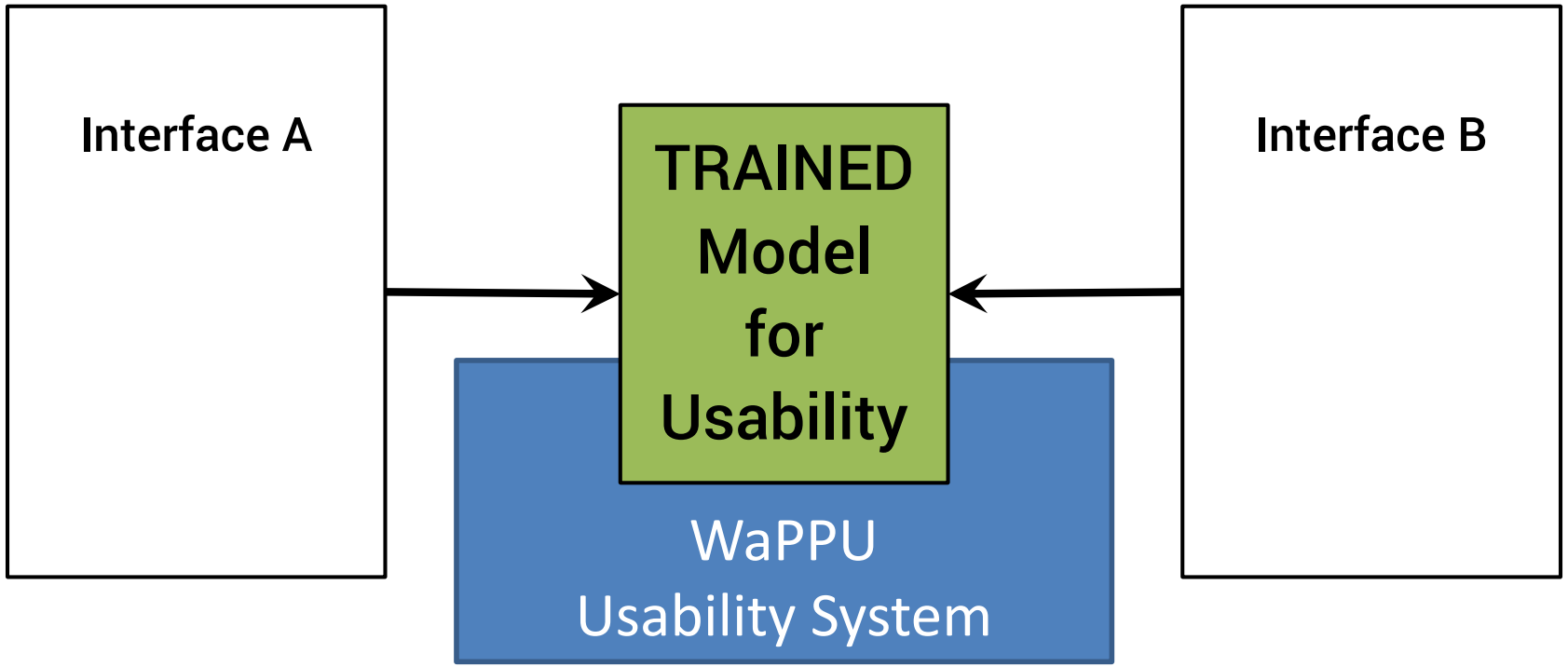
Idea: Infer quantitative measure of usability from user interactions.

Usability-based Split Testing



[WaPPU – Usability based A/B-Testing
Speicher, Both, Gaedke, **ICWE2014**]

Usability-based Split Testing



[WaPPU – Usability based A/B-Testing
Speicher, Both, Gaedke, **ICWE2014**]

Usability Model allows for: f(cause) = score

(cause is part of usability)

	Interface "A"	*Interface "B"*
	Based on **8** users.	Based on **8** users.
Overall Usability	81.3% ± 37.2%	18.8% ± 37.2%
informativeness	0.6 ± 0.5	-0.6 ± 0.5
understandability	0.6 ± 0.5	-0.6 ± 0.5
confusion	0.6 ± 0.5	-0.6 ± 0.5
distraction	0.6 ± 0.5	-0.6 ± 0.5
readability	0.6 ± 0.5	-0.6 ± 0.5
infDensity	0.6 ± 0.5	-0.6 ± 0.5
accessibility	0.6 ± 0.5	-0.6 ± 0.5

Interface **"B"** is *significantly worse* than interface **"A"**.

Limitations?

Sure!

f(cause) = score

this function is *not bijective*

(Not possible to infer *optimizations* from usability scores)

How to **overcome** the *f(cause) = score* ***limitations?***

Catalog of best practices

a.k.a. Set of causes and optimizations

SERP Optimization Suite (S.O.S.)

WaPPU
for evaluation

Catalog
of best practices

Gefördert aus Mitteln der Europäischen Union

Europa fördert Sachsen.
ESF
Europäischer Sozialfonds

[S.O.S.: Does Your Search Engine Results Page (SERP) Need Help?
Speicher, Both, Gaedke, **CHI 2015**]

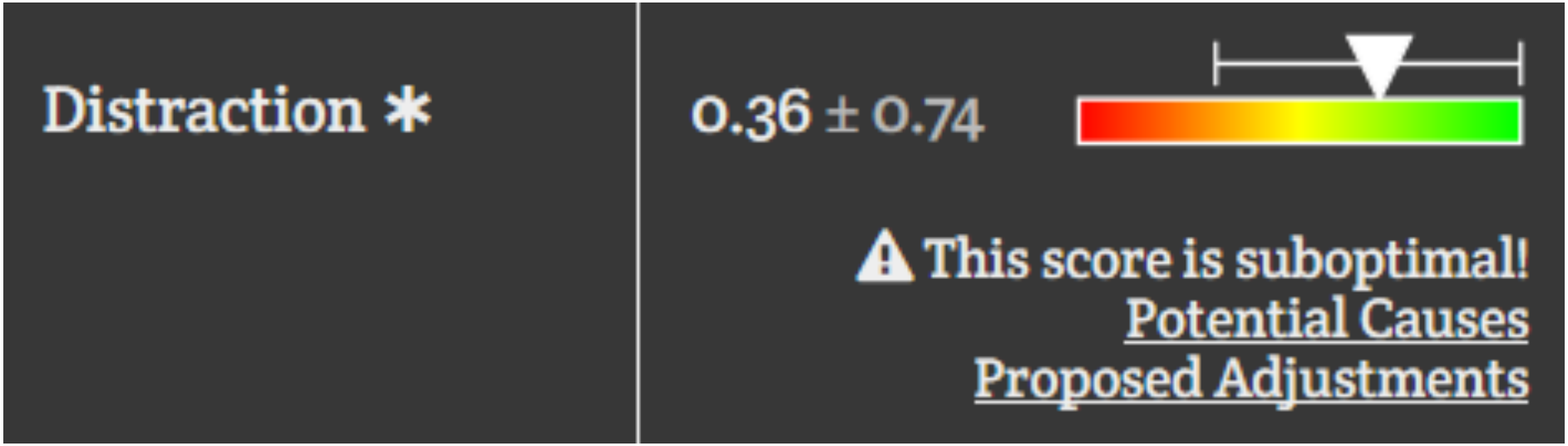
$$f_u(score) = \{C, C'\}$$

u = usability item number

C = potential causes

C' = countermeasures

S.O.S. example: "We have a problem with Distraction"



A. **Informativeness**
- I. bad index quality (desired result[s] not present on page)
- II. bad ranking quality (desired result[s] not present or ranked too low)
- III. desired result not clearly identifiable:
  - a. inappropriate title and/or abstract
  - b. too many other results
  - c. too much content other than results
- 2. ⑨ provide search suggestions / related search terms
- 6. clarify layout:
  - b. ①④⑧ clearly separate results from other content such as ads (or remove the latter) *[2–1]*
  - c. ①②③ reduce amount of content other than results
  - e. ④ clearly separate title from abstract *[3–0]*

B. **Understandability**

C. **Confusion**
- II. too many irrelevant results *[3–0]*
- III. too much content other than results
- IV. too many advertisements which are poorly marked as such; no clear separation between advertisements / sponsored results and real results *[6–0]*
- 2. ⑧ clearly highlight results and mark other content as such
- 5. ①②③ reduce amount of content other than results

D. **Distraction**
- I. too much content other than results
- III. too many images
- IV. non-results more salient than results *[2–1]*
- V. overloaded results (e.g., displaying secondary information, social media buttons etc.)
- 1. ①②③ reduce amount of content other than results
- 3. ③ reduce amount of images
- 4. ③④⑤⑥⑦⑧ ensure that results are more salient than other content *[3–0]*
- 5. clarify presentation of results:
  - a. ② reduce to: title, URL, abstract

E. **Readability**
- I. wrong font size or character spacing (too small / too large) *[9–0]*
- II. wrong line height (too small / too large) *[6–0]*
- V. text not properly grouped (e.g., via white space or separation lines) *[3–0]*
- VII. inconsistent alignment of results and/or other elements of the page
- 1. ⑤ adjust font size or character spacing (or offer according option to reader) *[11–1]*
- 2. ⑤ adjust line height *[9–0]*
- 5. add white space:
  - a. ④⑦ between title, URL and abstract of result
  - b. ④ between results
  - c. ④⑦ between results and other content
- 7. ⑥⑦ align results and other elements of the page consistently

F. **Information Density**
- III. too much content other than results; content that is not related to results *[3–0]*
- IV. too little white space
- V. missing visual hierarchy with salient results *[2–1]*
- VI. overloaded results (e.g., displaying secondary information, social media buttons etc.)
- 3. ①②③ reduce amount of content other than results
- 4. add white space:
  - a. ④⑦ between title, URL and abstract of result
  - b. ④ between results
  - c. ④⑦ between results and other content
- 5. ⑥⑦⑧ introduce contrast and visual hierarchy to separate results from content other than results *[3–0]*
- 10. clarify presentation of results:
  - a. ② reduce to: title, URL, abstract
- 11. ③ remove unnecessary icons/abbreviations or add explaining tooltips *[3–0]*

G. **Accessibility**
- I. too much scrolling effort for user:
  - a. too much content other than results, especially above results
  - d. bad ranking quality (desired result[s] not present or ranked too low)
- II. desired result(s) not immediately identifiable:
  - b. missing visual hierarchy *[2–1]*
  - c. missing contrast between results and other content *[3–0]*
- 1. reduce scrolling effort:
  - a. ① reduce amount of content other than results, especially above results
- 2. better highlight results / improve result presentation:
  - b. ⑧ introduce contrast and visual hierarchy to separate results from content other than results *[2–1]*
  - c. ③④⑤⑥⑦⑧ ensure that results stand out against other content

A. **Informativeness**
   I. bad index quality (desired result[s] not present on page)
   II. bad ranking quality (desired result[s] not present or ranked too low)
   III. desired result not clearly identifiable:
      a. inappropriate title and/or abstract
      b. too many other results
      c. too much content other than results
   2. ⑨ p
   6. clar
      b.
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      e.

B. **Understa**

C. **Confusio**
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   III. too
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   5. ①②

D. **Distracti**
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   III. too
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   1. ①②
   3. ③ r
   4. ③④⑤⑥⑦⑧ ensure that results are more salient than other content *[3–0]*
   5. clarify presentation of results:
      a. ② reduce to: title, URL, abstract

E. **Readability**
   I. wrong font size or character spacing (too small / too large) *[9–0]*
   II. wrong line height (too small / too large) *[6–0]*
   V. text not properly grouped (e.g., via white space or separation lines) *[3–0]*
   VII. inconsistent alignment of results and/or other elements of the page
   1. ⑤ adjust font size or character spacing (or offer according option to reader) *[11–1]*
   2. ⑤ adjust line height *[9–0]*
   5. add white space:
      a. ④⑦ between title, URL and abstract of result
      b. ④ between results
      c. ④⑦ between results and other content
   7. ⑥⑦ align results and other elements of the page consistently

F. **Information Density**
   II. desired result(s) not immediately identifiable:
      b. missing visual hierarchy *[2–1]*
      c. missing contrast between results and other content *[3–0]*
   1. reduce scrolling effort:
      a. ① reduce amount of content other than results, especially above results
   2. better highlight results / improve result presentation:
      b. ⑧ introduce contrast and visual hierarchy to separate results from content other than results *[2–1]*
      c. ③④⑤⑥⑦⑧ ensure that results stand out against other content

5. ①②③ reduce amount of content other than results

D. **Distraction**
   I. too much content other than results
   III. too many images
   IV. non-results more salient than results *[2–1]*
   V. overloaded results (e.g., displaying secondary information, social media buttons etc.)
   1. ①②③ reduce amount of content other than results
   3. ③ reduce amount of images
   4. ③④⑤⑥⑦⑧ ensure that results are more salient than other content *[3–0]*
   5. clarify presentation of results:
      a. ② reduce to: title, URL, abstract

E. **Readability**

User Study

- 81 participants (~62% male)
- avg. age = 31.08 years
- Task: Solve a problem

"Find a birthday present for a good friend that does not cost more than 50 Euros."

New York City

alle Hotels in der Nähe anzeigen

New York [nu:ˈjɔːk] (offiziell City of **New York**) ist eine Weltstadt an der Ostküste der Vereinigten Staaten. Sie liegt im Bundesstaat **New York** und ist mit mehr a... mehr

- Sehenswürdigkeiten in **New York City**
- Hotels **Vereinigte Staaten**
- Last Minute **New York City**
- Flüge **Vereinigte Staaten**
- Hotels **New York City**
- Flüge **New York City**

Details | Relevanz: 0 0 | Kommentare: 0 | Gefällt mir | +1

NEU! **Hotel Mallorca Khao Lak** -70% +++ Ramada - **Khao Lak** - Spanien

Hotel The Westin Leipzig, Leipzig, Sachsen 168 Hotelbewertungen für The Westin Leipzig Angebote The Westin Leipzig, Urlaub The Westin Leip...

http://www.hlx.de/Hotel%2CThe+Westin+Leipzig%2Chot_22910

Details | Relevanz: 0 0 | Kommentare: Sei Erster! | Gefällt mir | +1

Hotel Mallorca Khao Lak: Ihr luxuriöses 4.5 Sterne **Hotel**

Hotel The Westin Leipzig, Leipzig, Sachsen 168 Hotelbewertungen für The Westin Leipzig Angebote The Westin Leipzig, Urlaub The Westin Leip...

http://www.weg.de/hotel/the-westin-leipzig-4209

Details | Relevanz: 0 0 | Kommentare: Sei Erster! | Gefällt mir | +1

NEU! **Hotel Mallorca Khao Lak** -70% +++ Ramada - **Khao Lak** - Spanien

Hotel The Westin Leipzig, Leipzig, Sachsen 168 Hotelbewertungen für The Westin Leipzig Angebote The Westin Leipzig, Urlaub The Westin Leip...

http://www.booking.com/Hotel%2CThe+Westin+Leipzig%2Chot_22910

Details | Relevanz: 0 0 | Kommentare: Sei Erster! | Gefällt mir | +1

Verwandte Suchanfragen:

- Wetter **Mallorca** 14 Tage
- **Mallorca** Wetter 14 Tage
- Wetter Auf **Mallorca**
- Wetter in **Mallorca**
- Mietwagen **Mallorca**
- Wetter **Mallorca**
- Wettervorhersage **Mallorca**
- **Mallorca** Wetter
- **Hotel Mallorca**
- Flug **Mallorca**

Hotel Mallorca Khao Lak: Ihr luxuriöses 4.5 Sterne **Hotel**

Hotel The Westin Leipzig, Leipzig, Sachsen 168 Hotelbewertungen für The Westin Leipzig Angebote The Westin Leipzig, Urlaub The Westin Leip...

http://www.weg.de/hotel/the-westin-leipzig-4209

Details | Relevanz: 0 0 | Kommentare: Sei Erster! | Gefällt mir | +1

❶ Reduce amount of advertisements

❷ Reduce results to title, URL and abstract

❸ Remove social media buttons

❹ Add white space

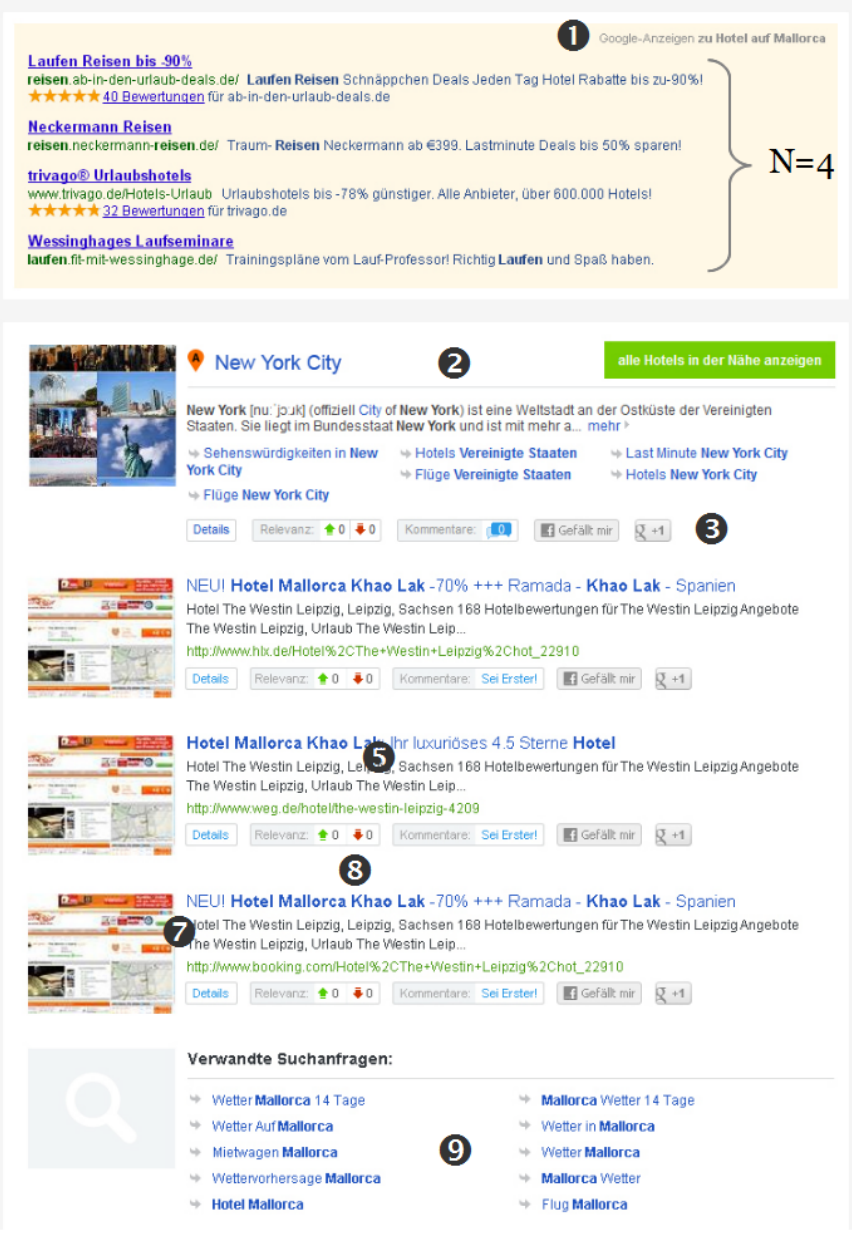
❺ Increase font size / line height

❻ Better alignment

❼ Clearer separation between images & text

❽ Separate results more clearly

❾ Optimize related search terms



Results

	old SERP		new SERP
informativeness	-0.17 ↓	<	-0.02 ↓
understandability	0.34 ↓	<	0.45 ↓
confusion	0.30 ↓	<	0.38 ↓
distraction*	0.36 ↓	<	0.62 ↗
readability	0.45 ↓	<	0.52 ↓
information density*	0.04 ↓	<	0.43 ↗
accessibility	0.06 ↓	<	0.07 ↓
overall usability*	59.86% ↓	<	67.50% ↗

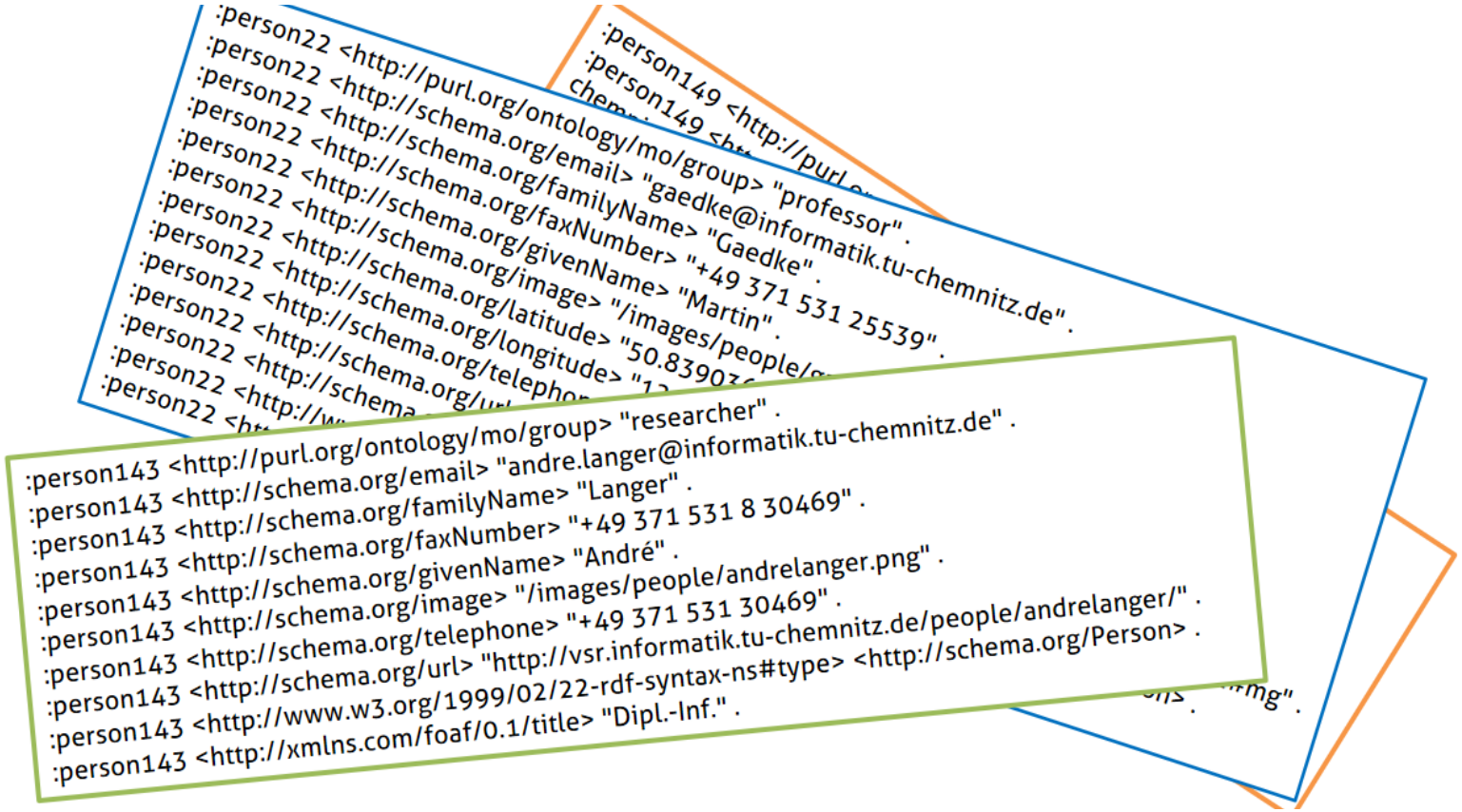
Concluding thoughts

Conclusions

- *S.O.S.* significantly improved SERP usability
- Approach developed using HCD/DT
  - obtaining usability scores through *WaPPU* and
  - recommendations for optimization from a *catalog* for suboptimal scores
  - http://vsr.informatik.tu-chemnitz.de/demo/SOS

Future Work

- Catalogs for other categories of Web pages
  - Creating trained model for web page and site categories
  - Crating more generic and reusable catalogs
  - Reducing the learning time
- Applying the approach to the quality of linked enterprise data
  - Improving: incorrect, incomplete etc. data
  - Dealing with: Co-evolution, Coherence etc.
  - Data Quality → Fit for business use
  - LEDS project: http://www.leds-projekt.de/



$$DQ_{context} = \langle \sum_{Levels} \sum_{reqs} \omega_{req} \cdot fulfill(req, obj) \rangle + \varphi$$

Data Quality can be interpreted as the degree to which data fits to current requirements

```
sqc:QualityChecker
    a prov:SoftwareAgent ;
    rdfs:label "SemQuire Quality Assessment component"^^xsd:

sqa:Activity1
    a prov:Activity;
    rdfs:label "The checking of myDatasetDistribution's qual
    prov:wasAssociatedWith sqc:QualityChecker;
    prov:used              sqd:DatasetDistribution;
    prov:generated         sqr:ContentTypeMeasurement ;
    prov:startedAtTime     "2016-10-24T11:16:02Z"^^xsd:dateT
    prov:endedAtTime       "2016-10-24T11:16:03Z"^^xsd:dateTi

sqd:MovieDataset
    a dcat:Dataset ;
    dcterms:title "Movies from DBPedia" ;
    dcat:distribution :RDFDumpDatasetDistribution .

sqd:RDFDumpDatasetDistribution
    a dcat:Distribution ;
    dcat:downloadURL <http://www.semquire.net/Data/Distribut
    dcterms:title "RDF Dump of DataSet" ;
    dcat:mediaType "application/rdf+xml" ;
    dcat:byteSize "5321928"^^xsd:decimal
    dqv:hasQualityMeasurement :ContentTypeMeasurement, :Dere

sqr:ContentTypeMeasurement
    a dqv:QualityMeasurement ;
    dqv:computedOn :RDFDumpDatasetDistribution ;
    dqv:isMeasurementOf sqc:NoMisreportedContentTypeMetric ;
    dqv:value "true"^^xsd:boolean
    prov:wasAttributedTo :QualityChecker ;
    prov:generatedAtTime "2016-10-24T11:16:03Z"^^xsd:dateTim
    prov:wasGeneratedBy sqa:Activity1 .

sqr:DereferencedForwardLinksMeasurement
    a dqv:QualityMeasurement ;
    dqv:computedOn :RDFDumpDatasetDistribution ;
    dqv:isMeasurementOf sqc:DereferencedForwardLinksMetric ;
    dqv:value "3216"^^xsd:integer
    prov:wasAttributedTo :QualityChecker ;
    prov:generatedAtTime "2016-10-24T11:16:09Z"^^xsd:dateTim
    prov:wasGeneratedBy sqa:Activity2 .

sqc:Accessibility a dqv:Category ;
   skos:prefLabel "Accessibility dimensions"@en .

sqc:Availability
    a dqv:Dimension ;
```

LEDS

LINKED ENTERPRISE DATA SERVICES

First Inspiring Results

Output of Fitness results of our Quality Assessment tool with the means of the data quality vocabulary (dqv)

Feel free to visit:

www.leds-projekt.de

GEFÖRDERT VOM

Bundesministerium für Bildung und Forschung

Thank You!

martin@gaedke.com

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@gaedke /gaedke